

**TEKTRONIX®**

**1441  
VIR SIGNAL  
DELETER/INSERTER**

**INSTRUCTION MANUAL**

Tektronix, Inc.  
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Serial Number

B010152



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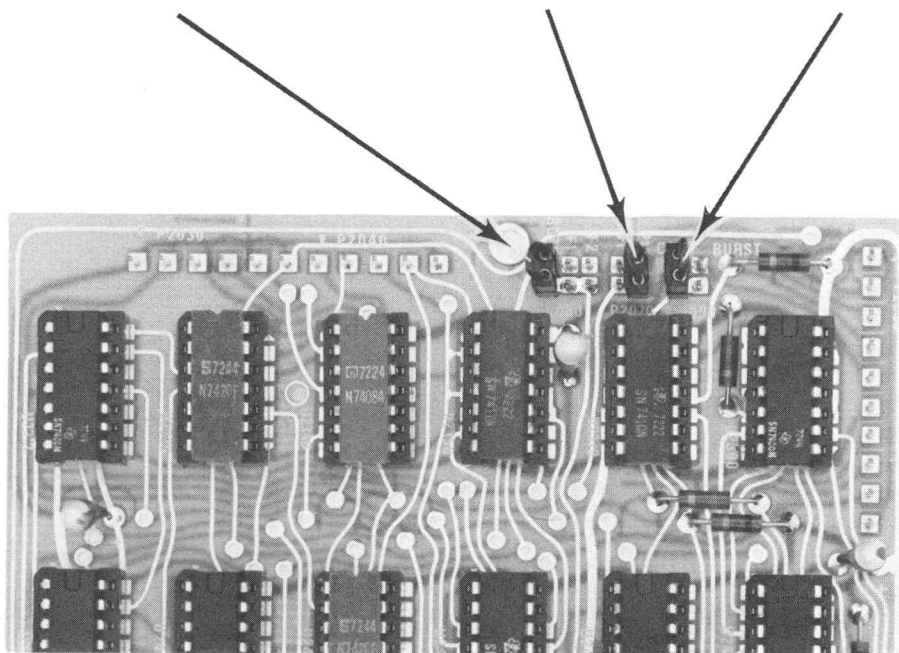
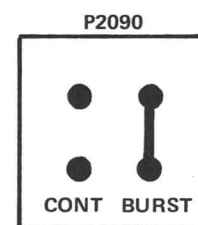
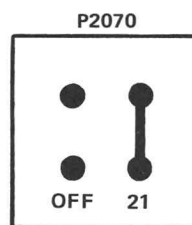
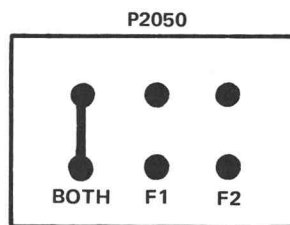
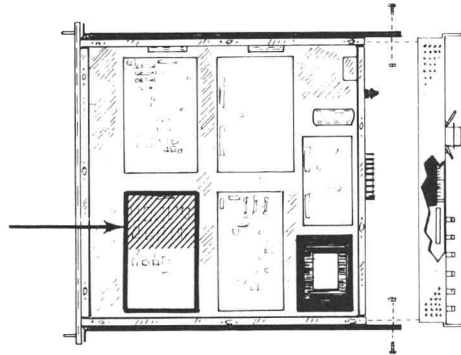
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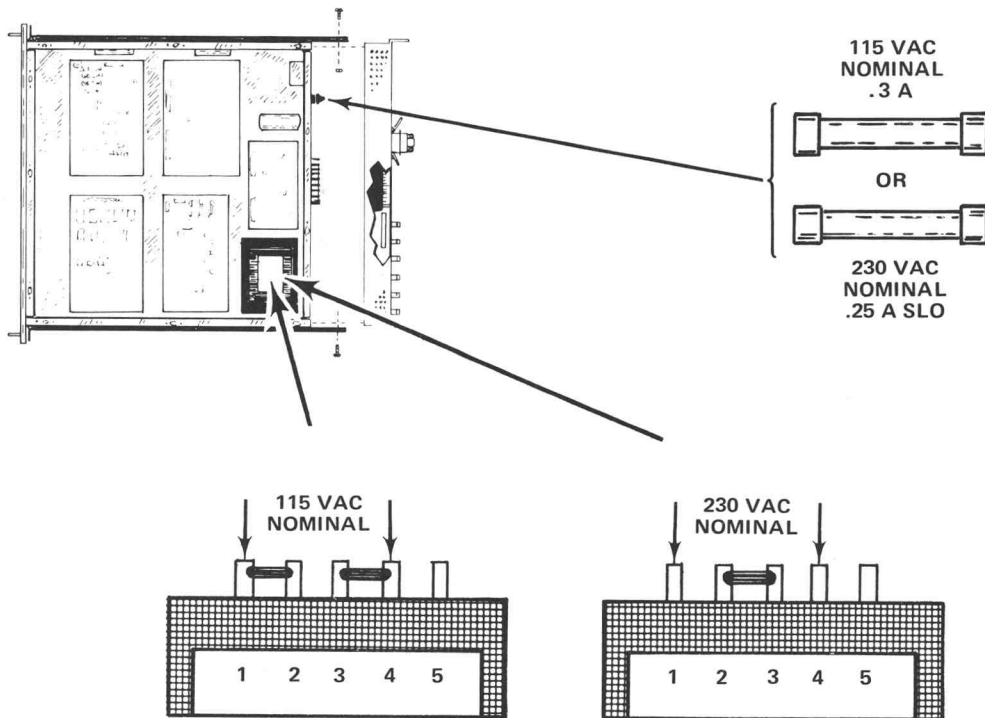
# INSTALLATION

Your instrument has been shipped from the factory wired according to your instructions. Perform the following steps:

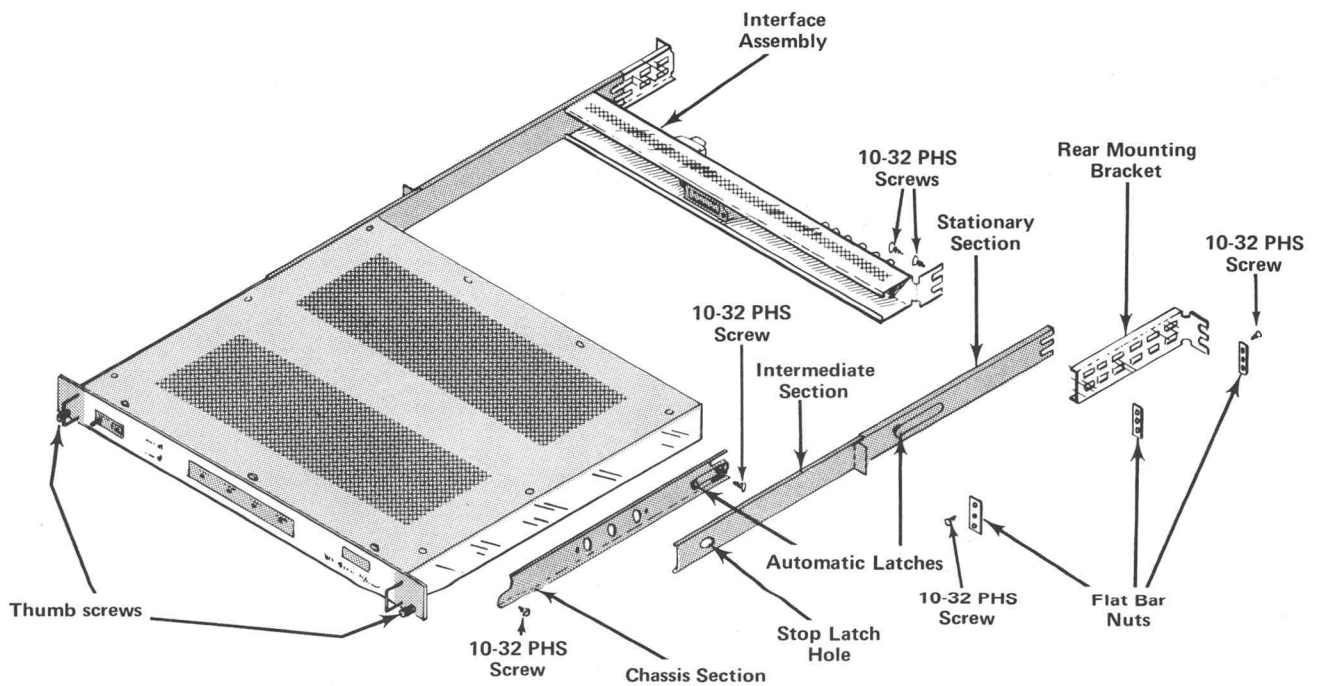
## 1. Check programming

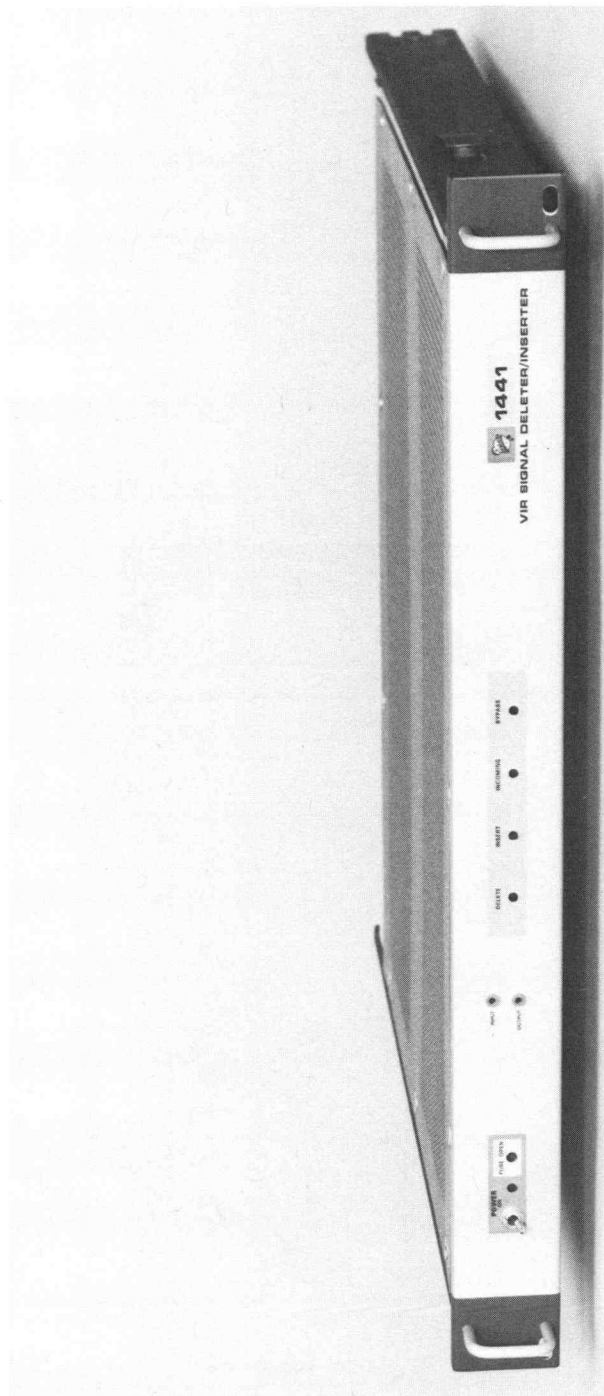


## 2. Power Connections



## 3. Install in rack







# OPERATING INSTRUCTIONS

## Introduction

This section of the manual provides the operator with information necessary for the proper operation of the 1441. Included are (1) Instrument description; (2) A functional check-out procedure using each control and connector, along with all operational changes available in the instrument; (3) Remote control switching method; (4) Specification; and (5) A glossary of terms.

## Description

The 1441 VIR SIGNAL DELETER/INSERTER deletes signals on selected lines during the vertical interval, and inserts the Vertical Interval Reference (VIR) Signal (see Fig. 1-1).

Deletion and insertion functions can be by remote control. Remote includes:

Passive	Line programmed for the VIR Signal passes without disturbance.
Insert	Always delete incoming signals and insert a locally generated VIR Signal.
Auto	Insert only if an upstream VIR Signal is not present.
Delete	Delete any signal on the line programmed for VIR Signal insertion.

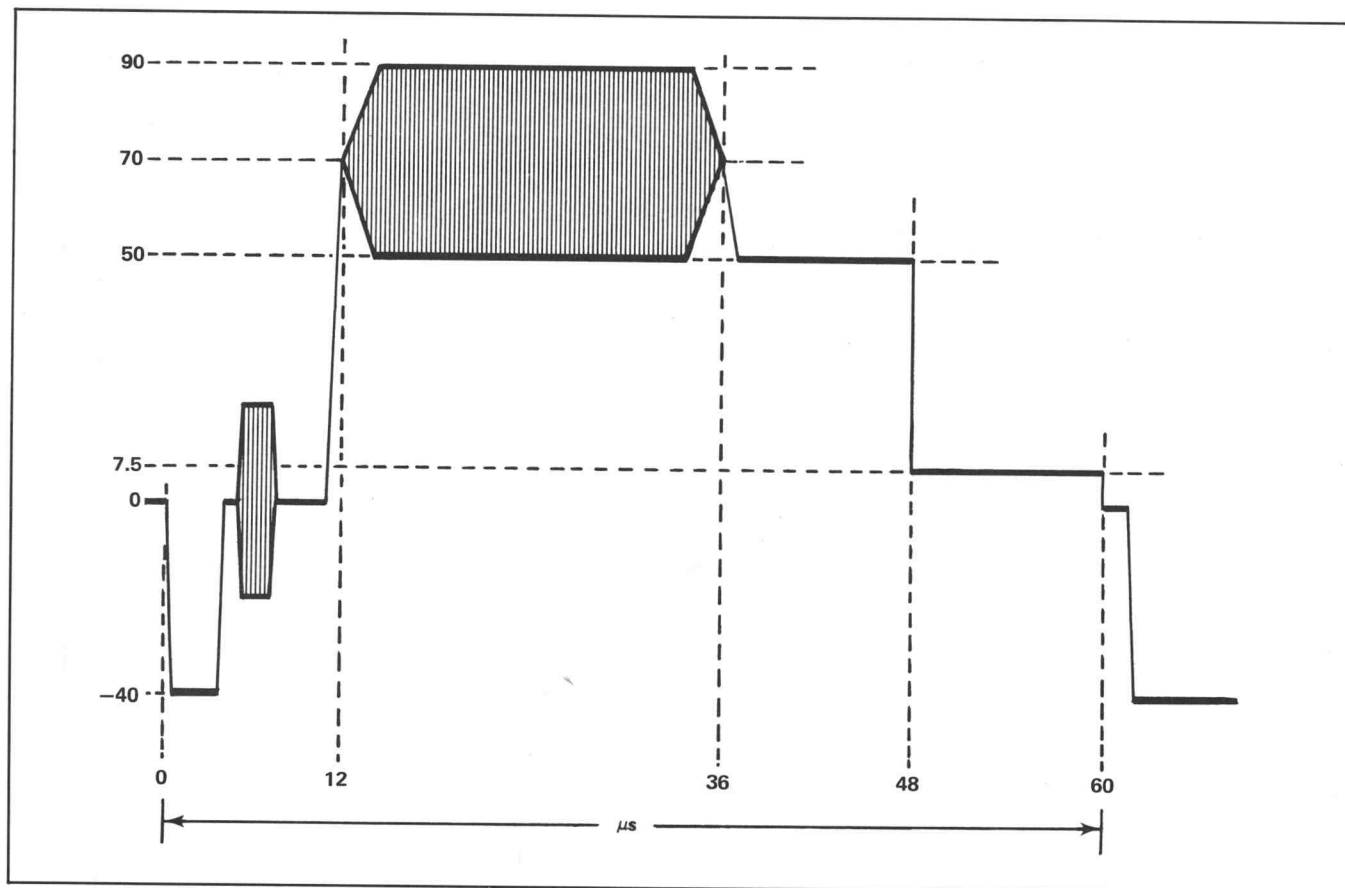


Fig. 1-1. VIR Signal Details

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In the event of power failure, an actuated remote bypass switch, or removal of the 1441 from the rack, a relay routes the program signal so that program line continuity is maintained.

For supplementary information refer to EIA TELEVISION SYSTEMS BULLETIN No 1, July, 1972: EIA Recommended Practice for Use of a Vertical Interval Reference (VIR) Signal.

### Functional Check-out Procedure

This procedure is intended to familiarize the operator with the various functions of the 1441. The procedure requires use of (1) a video test signal source capable of providing composite video, VIT Signals (programmable to any line), and a VIR Signal; (2) a waveform monitor to observe field and line rate displays. See Fig. 1-2 for location of jumpers mentioned in this procedure.

1. Remove the top dust cover to provide access to the interior operational change plug-jumpers. Connect the 1441 to a suitable source of power.

2. Set the POWER switch to ON. Note that the green power on indicator is lit and the red BYPASS lamp is lit, indicating no incoming program signal. The PROGRAM IN and PROGRAM OUT connectors are now connected to each other through the bypass relay.

3. Connect composite video, with VIR Signals inserted on Line 20 of both fields, from the video signal source to the 1441 PROGRAM IN connector on the rear section. Note that the red BYPASS lamp is now extinguished and the green VIR SIGNAL INCOMING lamp is lit. This indicates that the 1441 has locked to the incoming signal and has detected the VIR Signal.

4. Display the 1441 PROGRAM OUT vertical interval on a waveform monitor. Remove the connectors from P2800. This deletes the chrominance from the 1441 VIR Signal, making identification easier. Move the VIR Signal selector line from 20 to 17. Note that the incoming VIR Signal appears on line 20, the 1441 VIR Signal appears on line 17, the VIR SIGNAL INCOMING lamp is out, and the DELETE and INSERT lamps are lit. The lamps indicate that no VIR Signal is detected on line 17 but any VIT Signal (see glossary of terms) will be detected and that the 1441 VIR Signal is inserted. Check that VIT Signals are deleted and the 1441 VIR Signal is inserted by moving the VIR Signal selector to a line that has a VIT Signal on it.

5. Move P2050 on the Modulator board to F1. Select field 1 on the waveform monitor. Note that the 1441 VIR

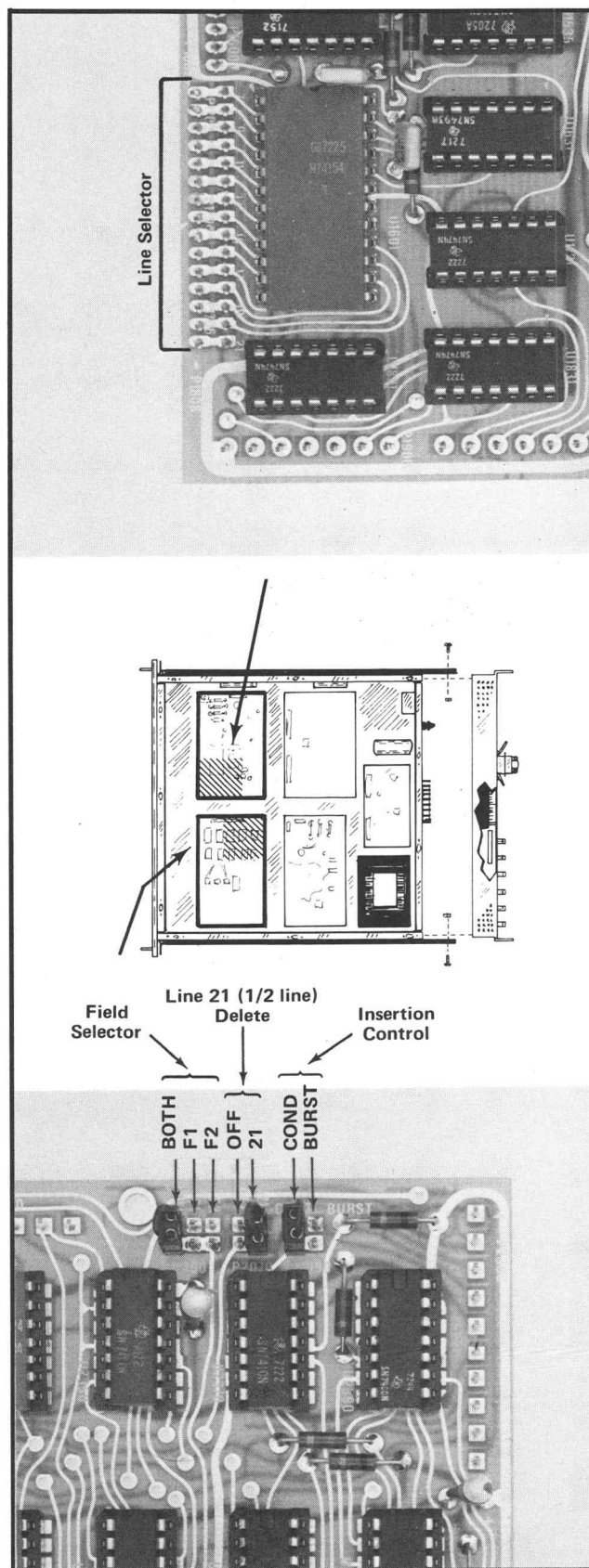


Fig. 1-2. Operating change locations

Signal appears on field 1 but not field 2. Move P2050 to F2 and note that the 1441 VIR Signal is in field 2 but not field 1. Move P2050 to BOTH. The 1441 VIR Signal is now in both fields.

6. Program the video signal source to place a VIT Signal on line 21 of both fields. Move P2070 to the 21 position. Note that the first half line of line 21 has been deleted in both fields. Move P2070 to OFF.

7. Note the line on which the 1441 VIR Signal is inserted and replace the connectors on P2800. Chrominance has now been restored to the 1441 VIR Signal. Remove the color burst from the incoming video signal. No 1441 VIR Signal will be inserted and the DELETE and INSERT lamps will be out. Move P2090 to CONT. The 1441 VIR Signal will be restored. DELETE and INSERT lamps will be lit. Restore color burst to the incoming video and move P2090 to BURST.

8. Move the VIR Signal selector to line 20. The DELETE and INSERT lamps will be out and VIR SIGNAL INCOMING lamp lit. The incoming VIR Signal will appear on line 20. Remove the VIR Signal from the incoming video. The VIR SIGNAL INCOMING lamp will be out and the DELETE and INSERT lamps lit. The 1441 VIR Signal will appear on line 20. Restore the VIR Signal to incoming video.

9. Deletion of any inserted signal on lines 10 through 21 can be accomplished by placing the Deletion lead on the

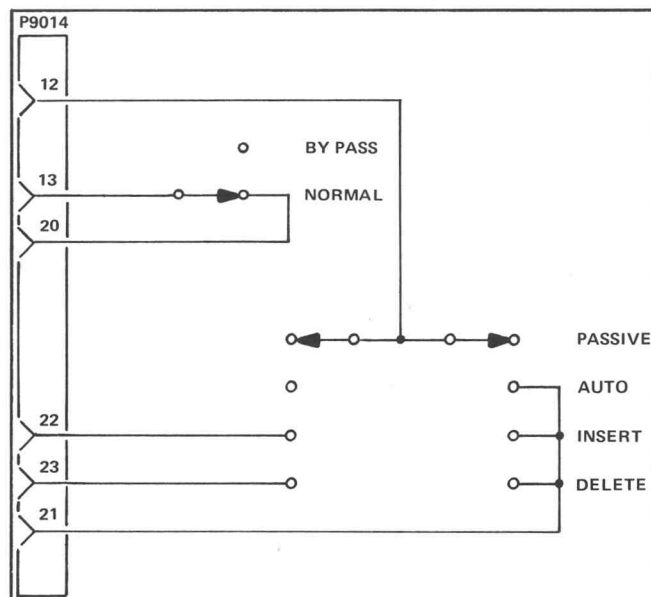


Fig. 1-3. Remote connector wiring

desired line. To check this, move the Deletion lead from P1600-1, where it is stored, to line 20. Note that the VIR Signal has been removed from the line. Store the Deletion lead on P1600-1.

10. Remote switching of VIR Signal can be accomplished by use of the REMOTE plug P9014. As shipped from the factory, the 1441 is wired for local operation. For remote operation, P9014 must be rewired.

## SPECIFICATION

### Main Signal Path Electrical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Input/Output Signal Transfer	Unity gain within 0.5%	
Blanking DC Level	0 V within 50 mV	
Input Impedance		75 $\Omega$ nominal
Input Return Loss	46 dB to 5 MHz, operating 40 dB to 5 MHz, bypass mode	
Output Impedance		75 $\Omega$ nominal

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Characteristic	Performance Requirement	Supplemental Information
Output Return Loss	30 dB to 5 MHz	At subcarrier frequency
Video Delay	48° within 5°	
Insertion Gain	0 dB within 0.1 dB	
Amplitude Ratio		
2T Pulse to Bar Amplitude	100% within 0.25%	
Mod Sin <sup>2</sup> Pulse (Chrominance and Luminance)	100% within 0.5%	
Linear Waveform Distortion		
Field Time	0.5% or less	Using field rate squarewave test signal measured differentially <sup>1</sup>
Line Time	0.25% or less	Using 26 μs bar
Short Time		
T Pulse/Bar	2% or less	
2T Pulse/Bar	1% or less	
Non-Linear Waveform Distortion (10-90% APL)		
Diff Gain	0.2% or less	
Diff Phase	0.15% or less	
Dynamic Gain		
Pix	0.5% or less	
Sync	0.5% or less	
Line Time Amplitude Non-Linearity	0.25% or less	
Chrominance/Luminance		
Intermodulation	0.5% or less	

<sup>1</sup> See "Journal of the SMPTE", Volume 76, Aug 1967, by Frank Davidoff



Characteristic	Performance Requirement	Supplemental Information
Random Noise Output	At least 75 dB (RMS) down, to 5 MHz	Using weighting and lowpass filters
Non-Inserted Lines		
Residual Subcarrier	At least 60 dB down	Using 3.58 MHz Bandpass filter
Hum or transients	At least 60 dB down to 5 MHz	Using weighting and low pass filters
Spurious Signals	At least 40 dB down to 5 MHz	Using low pass filter
Signal Attenuation in Delete Mode		
2T Pulse	At least 70 dB down	Using 5 MHz low pass filter
Subcarrier	At least 60 dB down	Using the color bar test signal through a 3.58 MHz bandpass filter
Unwanted Pedestal at Time of VIR Signal Insertion	0.7 IRE or less	
Insert Delay Range	At least + and $-0.5\mu s$ ( $1\mu s$ total)	
Time Jitter		5 ns or less

## Vertical Interval Reference Signal

VIR Signal		
Chrominance <sup>1</sup>		
Amplitude	40 IRE within 0.4 IRE	
Phase	Same as burst within $0.5^\circ$	
Envelope Risetime		$\text{Sin}^2$ shaped

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Characteristic	Performance Requirement	Supplemental Information
Phase Change with Burst Amplitude Change	1° or less	Burst Amplitude varied from 40 IRE to 20 IRE or from 40 IRE to 80 IRE
Phase Change with Burst Frequency Change	1° or less	Burst frequency changed +10 Hz from 3.579545 MHz or -10 Hz from 3.579545 MHz
Luminance <sup>1</sup>		
Setup Level	7.5 IRE within 0.5 IRE	
Gray Level	50 IRE within 0.5 IRE	
Chroma Pedestal	70 IRE within 0.5 IRE	
Timing	See Fig. 1-1	

### Power Supply

Line Voltage Range		
115 VAC (nominal)	90 VAC to 132 VAC	
230 VAC		180 VAC to 264 VAC
Crest Factor		At least 1.35
Maximum Line Current	0.25A	
Maximum Power Consumption	20 W	
Line Frequency Change	54-66 Hz	
Fuse Data		
115 VAC		0.5 A
230 VAC		0.25 A

<sup>1</sup> All VIR Signal amplitudes are referenced to composite video signal composed of 286 mV of sync and 714 mV active portion.

## Environmental

Characteristic	Performance Requirement	Supplemental Information
Temperature		
Storage	−40°C to +65°C	
Operating	0°C to +50°C	
Altitude		
Storage	to 50,000 feet	
Operating	to 15,000 feet	

## Physical

Maximum Dimensions		
Length	16.890 inches	
Height	1.720 inches	
Width	19.000 inches	

## GLOSSARY OF TERMS

**ACTIVE VIDEO LINES:** All video lines not occurring in the vertical blanking interval.

**APL:** Average picture level. The average signal level, with respect to blanking level, during active picture scanning time, expressed as a percentage of the difference between the blanking and reference white levels.

**BACK PORCH:** That portion of the composite video signal which lies between the trailing edge of the horizontal sync pulse and the trailing edge of the horizontal blanking pulse.

**BLACK BURST:** A Signal consisting of composite sync and burst. Normally has setup.

**BLANKING LEVEL:** The level of the front and back porches of the composite video signal. Normally at 0 IRE.

**BREEZEWAY:** In NTSC color, the portion of the back porch between the trailing edge of the sync pulse and the start of the color burst.

**BURST FLAG:** Pulses used to key out a portion of the 3.579545 MHz sine wave subcarrier for use as a reference for the color signal.

**CHROMINANCE:** That property of light which produces a sensation of color in the human eye, apart from any variation in luminance that may be present.

**COLOR BAR:** A test signal, typically containing eight basic colors: white, yellow, cyan, green, magenta, red, blue, and black, which is used to check the chrominance functions of color TV systems.

**COLOR BURST:** In NTSC color systems, this normally refers to a burst of approximately 8 to 10 cycles of

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**3.579545 MHz subcarrier frequency** on the back porch of the composite video signal. This serves as a color synchronizing signal to establish a frequency and phase reference for the chrominance signal.

**COLOR SUBCARRIER:** In color systems, this is the carrier signal whose modulation sidebands are added to the monochrome signals to convey color information; in NTSC, it is a 3.579545 MHz sine wave.

**COMPOSITE BLANKING:** This signal is composed of pulses at line and field frequencies used to make the return traces of a picture tube invisible.

**COMPOSITE SYNC:** The line and field rate synchronizing pulses (including the field equalizing pulses) when combined together form the composite sync signal.

**COMPOSITE VIDEO:** For color, this consists of blanking, field and line synchronizing signals, color synchronizing signals, chrominance and luminance picture information. These are all combined to form the complete color video signal.

**DIFFERENTIAL GAIN:** The difference between (1) the ratio of the output amplitude of a small, high-frequency sine-wave signal at two stated levels of a low frequency signal on which it is superimposed and (2) unity.

**DIFFERENTIAL PHASE:** The difference in output phase of a small high-frequency sine-wave signal at two stated levels of a low-frequency signal on which it is superimposed.

**EIA:** An abbreviation for Electronic Industries Association.

**EQUALIZING PULSES:** Pulses of one half the width of the horizontal sync pulses which are transmitted at twice the rate of the horizontal sync pulses during the portions of the vertical blanking interval immediately preceding and following the vertical sync pulses. The purpose of these pulses is to cause the vertical deflection to start at the same time in each interval, and also serves to keep the horizontal sweep circuits in step during the portions of the vertical blanking interval immediately preceding and following the vertical sync pulse.

**FIELD:** One half of a complete picture (or frame) interval, containing all of the odd, or all of the even, lines of the picture.

**FIELD BLANKING:** Refers to the blanking signals which occur at the end of each field. Also called vertical blanking.

**FIELD FREQUENCY:** The rate at which one complete field is scanned, normally 59.94 times a second in NTSC.

**FRAME:** One complete picture consisting of two fields of interlaced scanning lines.

**FRONT PORCH:** That portion of the composite picture signal which lies between the leading edge of the horizontal blanking pulse and the leading edge of the corresponding sync pulse. Normally 1.59  $\mu$ s.

**GEN LOCK:** Subcarrier to burst lock.

**H RATE:** The time for scanning one complete line, including trace and retrace. NTSC equals 1/15734 second (color) or 63.56  $\mu$ s.

**IRE:** An abbreviation for Institute of Radio Engineers.

**IRE SCALE:** An oscilloscope scale that applies to composite video levels. There are 140 IRE units in 1 volt.

**LINE BLANKING:** The blanking signal at the end of each scanning line. Used to make the horizontal retrace invisible. Also called horizontal blanking.

**LINE FREQUENCY:** The number of horizontal scans per second, normally 15,734.26 times per second in NTSC.

**LUMINANCE (Y):** The amount of light intensity, which is perceived by the eye as brightness (referred to as 'Y').

**NTSC:** National Television Systems Committee. An industry-wide engineering group which, during 1950-1953, developed the color television specifications now established in the United States.

**REFERENCE WHITE LEVEL:** The level corresponding to the specified maximum excursion of the luminance signal in the white direction.

**SETUP:** The separation in level between blanking and reference black level. Normally 7.5 IRE.



**STAIRCASE:** A video test signal containing several steps at increasing luminance levels. The staircase signal is usually amplitude modulated by the subcarrier frequency and is useful for checking amplitude and phase linearities in video systems.

**SYNC:** An abbreviation for the words 'synchronization', 'synchronizing', etc. Applies to the synchronization signals, or timing pulses, which lock the electron beam of the picture monitors in step, both horizontally and vertically, with the electron beam of the pickup tube. The color sync signal (NTSC) is known as the color burst.

**VERTICAL BLANKING INTERVAL:** The blanking portion at the beginning of each field. It contains the

equalizing pulse, the vertical sync pulses, and VITS (if desired). Presently 18-21 lines duration.

**VERTICAL DRIVE:** A pulse at field rate used in TV cameras. Its leading edge is coincident with the leading edge of the vertical blanking pulse and its duration may be 10.5 lines.

**VIR SIGNAL:** Vertical Interval Reference Signal. A reference signal for amplitude and phase characteristics of a color television program.

**VITS:** Vertical Interval Test Signal. A signal which may be included during the vertical blanking interval to permit inservice testing and adjustment of video transmission.



## CIRCUIT DESCRIPTION

This section of the manual describes the electrical operation of circuits within the 1441, using a "block" description. The description is organized in relation to the individual diagrams and a master signal flow block diagram given on separate pull-out pages in the Diagram Section. Each block described is shown in these diagrams. Where new or unusual circuitry has been used or where additional detail is necessary, it is fully explained.

### DIAGRAM 1

The Sync Lock and Vertical timing circuitry reprocesses the incoming video composite sync, synchronizes the 1441 to the reprocessed composite sync, and generates the timing signals required for operation of the 1441.

#### Sync Separator

The circuit removes sync from the externally applied PROGRAM IN composite video signal. Processing of the composite sync reduces any degradation of the incoming composite sync, such as white noise, mains hum, etc. Processing of the composite sync is accomplished by clamping the sync tip level of the externally applied composite video to a predetermined level, then adjusting the blanking level by controlling the overall circuit gain.

Fig. 2-1 is a block diagram of the Sync Separator circuit and the description that follows is organized with respect to the block diagram and diagram 1.

The sync tip of the external video signal (applied to the PROGRAM IN connector) is clamped at the sync tip level by the Sync Tip Comparator circuit, consisting of voltage comparator CR1785 and Q1685, operating as a current switch. The comparator is rate-limited and uses the DC coupled sync to activate it. Once the comparator is switched, any tilt from the field or the line rate sync tips is eliminated. The rate limiting allows the feedback loop (through Q1775 and Q1773) to open at the trailing edge of the sync pulses, and makes the loop unresponsive to impulse noise. It also allows the Level Memory (C1769) to average the white noise on the sync tip during the time the loop is closed; this determines sync tip level.

The output from the Level Memory is applied to two filters. The high frequency errors (sync tip tilt) pass through the High Pass Filter (R1963 and C1965) to control

the Summing Amplifier (Q1771). The low frequency components are fed back via the Low Pass Filter (Q1967) to drive the AGC Amplifier (Q1871, Q1761, and Q1771). This eliminates most mains frequency interference.

The 50% Level Comparator (CR1763 and Q1671) processes the sync at the 50% amplitude point between the sync tip level and the blanking level, ensuring correct sync width.

The Blanking Level Comparator (CR1783 and Q1663) uses the difference in duty factor between the sync pulse width and blanking width to determine the blanking level. This method allows the entire system to function, since timing information is not required to close the AGC Loop. The Low Pass Filter (C1745) averages the output voltage of the comparator; this voltage controls the overall system gain through Q1761.

#### Horizontal Integrator, AFC Sampler, 1 MHz Oscillator, 64 $\mu$ s Counter, and Delayed Feedback.

The 1 MHz oscillator generates a pulse that is counted down to the line rate. The line rate gate is then compared to the external composite sync. Any timing error between these two signals produces an error voltage to change the oscillator frequency, thus keeping the 64  $\mu$ s counter in step with the external sync.

**1 MHz Oscillator.** Q1463 and Q1465 are the active components of the modified Colpitts oscillator. CR1181, L1367, C1471 and C1361 are the frequency-determining components. Sustaining feedback is provided via C1471. C1483 provides temperature compensation. The output of the oscillator, collector of Q1465, consists of positive-going pulses (limited sine waves), which are then used to toggle the 64  $\mu$ s counter.

**64  $\mu$ s Counter,** U1721, U1801, and U1831 form the stage. Each counter is level sensitive (positive) and divides the 1 MHz toggle pulses in a divide-by-2, divide-by-4.....divide-by-64 sequence.

**Delay Feedback.** U1501B combines three of the 64  $\mu$ s counter outputs to produce a negative gate, approximately 1  $\mu$ s wide, for each horizontal line. During the 8  $\mu$ s interval, this pulse disconnects CR1451, which allows C1461 to

## Circuit Description—1441

charge towards +15 volts at an approximate rate of  $0.5 \text{ V}/\mu\text{s}$  (Charge path via R1445). The ramp is then compared against the setting of R1001 (Insert Delay) by voltage comparator Q1255 and Q1353. When the ramp voltage exceeds the delay voltage, Q1353 is turned off and a ringing pulse is developed across L1151. This pulse is then peak-detected by CR1345 to drive the AFC Sampler.

**AFC Sampler.** Q1363 and Q1453 form the AFC Sampler. When Q1453 is turned on, Q1363 acts as a gate which allows the voltage obtained by the ramp in the Horizontal Integrator to be transferred to variable capacitance diode CR1181, which controls the 1 MHz oscillator.

**Horizontal Integrator.** During sync time, this stage produces a ramp that is sampled to control the 1 MHz Oscillator. Composite sync is coupled to switching pair Q1063-1065. This switch, during sync time, allows current determined by R1081 to charge C1185 via Q1065. This

produces a positive (approximately  $3 \text{ V}/\mu\text{s}$ ) ramp, made linear by Q1165. At approximately 4.7 volts positive, Q1163 is saturated to clamp the ramp, preventing breakdown of Q1363 in the AFC Sampler circuit.

At the end of sync time, Q1063 is turned on, and current via R1083 causes the ramp (made linear by Q1165) to go in a negative direction towards 0 volts at an approximate rate of  $2.5 \text{ V}/\mu\text{s}$ . Ramp voltage at sample time is transferred via the AFC Sampler stage to the 1 MHz Oscillator, which brings the  $64 \mu\text{s}$  Counter into step with the external sync.

## Vertical Integrator

The vertical integrator produces a ramp during the vertical serration pulses, which is then applied to the Peak Detector. This integrator is similar to the Horizontal Integrator except for circuit values.

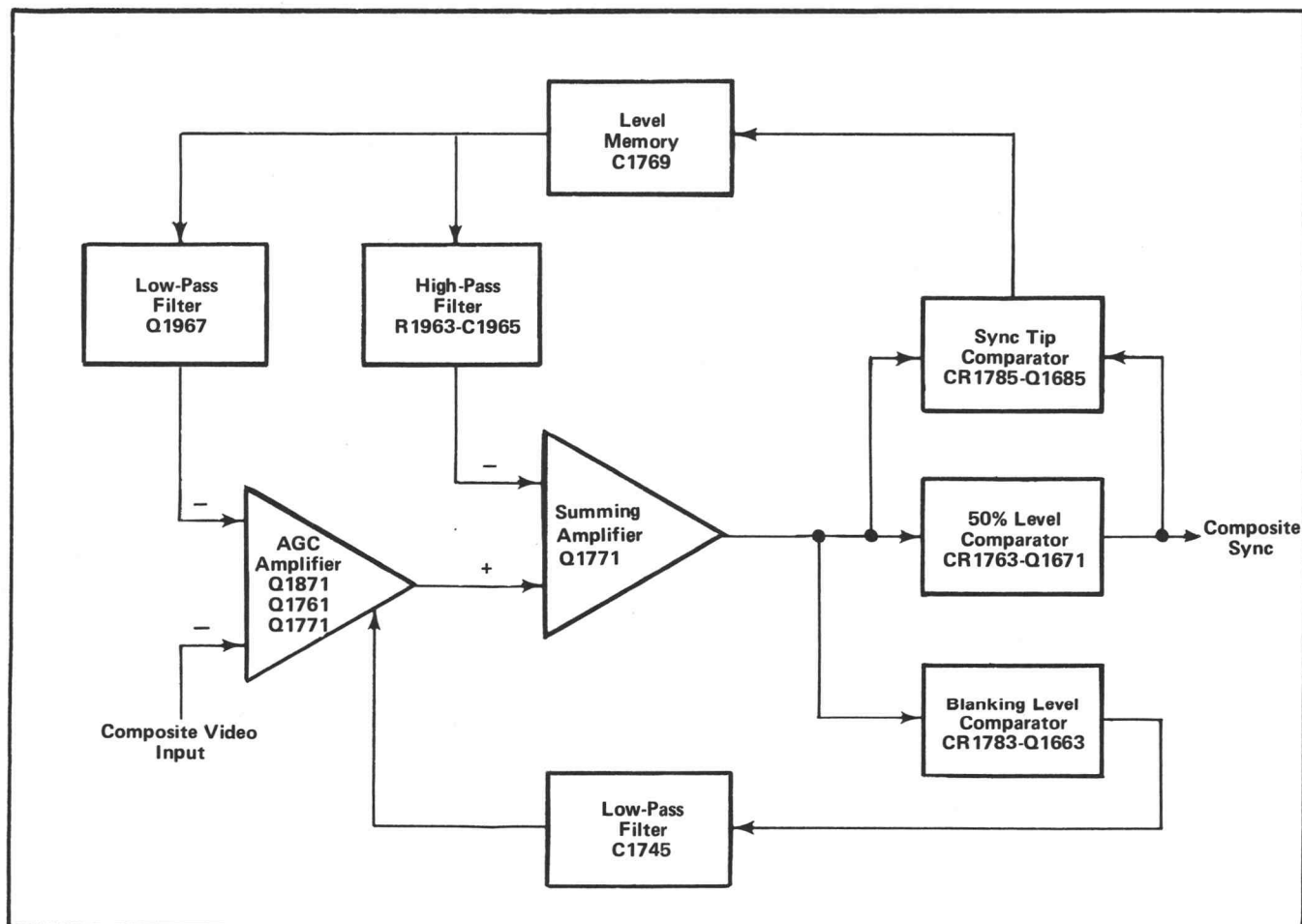


Fig. 2-1. Sync Separator block diagram.



## Peak Detector

On the last vertical serration pulse, Q1223 is biased on by the integrated serration pulses, producing one negative pulse per field to drive the Field Recognition and Line Counter circuits.

## Field Recognition

Q1225 and U1535A and B are the active components of this set-reset stage, and identify field 1 and field 2.

## Line Counter

This stage consists of U1535C and D, U1631, and U1601. Its purpose is to provide pulses which correspond to lines 7 through 21 of the vertical interval. These pulses are then used to select the lines on which insertion can be made.

## VIR Signal

U1535C and D is a set-reset flipflop, which is used to preset a  $\div 16$  counter (U1631). The counter is toggled at a line rate, which drives a decoder (U1601). The decoder, in turn, provides the line pulses to circuits on Diagrams one and two.

## DIAGRAM 2

## VIR Signal Chrominance Generator

A CW subcarrier signal is applied to P2990-4 from the Gen Lock circuitry on Diagram 4, and appears at the base of limiting amplifier, Q2980. C2298 and R2999 provide positive phase offset, allowing CR2994 and R2996 to react to both positive and negative phase compensation of the VIR Signal chrominance. The phase error signal is received from Diagram 6 and applied to CR2994 through R2990.

The output of amplifier Q2980 is limited by CR2974 and CR2976 to about 1 V peak to peak, allowing for changes in sine-wave level caused by varying attenuation with phase shift corrections. The limited subcarrier is applied to pin 8 (carrier input) of U2950.

At the time of VIR Signal chrominance insertion (from  $12\ \mu\text{s}$  to  $34\ \mu\text{s}$  of the line selected), CR2700 and CR2702 are reverse-biased, allowing current from R2722 and R2724 to flow through the current source, Q2720. This current is applied to a low pass sine-squared filter with a risetime of  $1\ \mu\text{s}$ . A voltage pulse is developed across termination resistor R2742 and appears at pin 1 of U2950. The output of U2950 is applied to T2930 and to a low pass filter removing harmonics generated in the modulator.

## Luminance Pedestal

The Luminance Pedestal is formed by three current switches: Q2500-CR2514: Q2520-CR2524: and Q2540-CR2544 which are enabled simultaneously  $12\ \mu\text{s}$  after the start of the selected VIR Signal insertion line. After  $34\ \mu\text{s}$ , current switch Q2540, CR2544 is disabled and the 70 IRE reference pedestal is removed. After  $48\ \mu\text{s}$  the 50 IRE pedestal is removed by disabling current switch Q2520-CR2524. The 7.5 IRE setup level is removed after  $60\ \mu\text{s}$  by disabling current switch Q2500-CR2514. The output of the current switches is applied to a 2T sine-squared filter, developing a voltage signal across terminating resistor R2602. The signal is sent from P2600-1 to circuitry in the Amplifier, Diagram 3.

## VIR Signal Detector

Incoming video is received at P2590-8 and is applied to the base of emitter follower, Q2690. Series resonant networks C2678, L2676; and C2778, L2776 couple chrominance information to the bases of Q2670 and Q2770 when pin 4 of U2490C and pin 6 of U2490B are high. Pin 6 of U2490B is high from  $12\ \mu\text{s}$  to  $36\ \mu\text{s}$  after the start of the line selected for VIR Signal insertion. Pin 4 of U2490C is high from  $36\ \mu\text{s}$  period, the collector of Q2670 will go low, applying a low to pin 9 of U2390 through emitter follower Q2660, causing pin 8 of U2390 to go low. If chrominance is present during the  $36\ \mu\text{s}$  to  $60\ \mu\text{s}$  period of the line (indicating some signal other than the VIR Signal is present), Q2770 will turn on, applying a low to pin 13 of U2390, resetting it. If only the VIR Signal is present, pin 8 of U2390 will be low from line 6 through the line selected for VIR Signal insertion and high for the remainder of the field. The average DC level at pin 9 of U2490D (output of RC low pass filter R2556, C2554) will be high, causing a low at the base of Q2570. Q2570 will saturate, turning on the front panel VIR Signal INCOMING lamp, and providing a high level for the automatic insertion-deletion logic.

If the VIR Signal is not present on the selected line, Q2570 will be off and the INCOMING lamp will be out.

U2490E receives a field rate pulse from timing circuitry on Diagram 1 to ensure that RS Flip-Flop, U2390 is reset at line 6 in the event no chrominance is present on the selected line.

## Logic

Circuitry on Diagram 1 provides five time intervals for operation of the logic circuit blanking, chroma, 70 IRE pedestal, 50 IRE pedestal, and 7.5 IRE setup level.

Nine microseconds after the leading edge of the line sync, U2310B senses both high inputs, and sets blanking RS

## Circuit Description—1441

flip-flop, U2410B and C. The high output from U2410B and C (pins 6 and 10) is applied to inputs of U2450A, U2450B and U2350B to limit the duration of the blanking interval going to the Amplifier, Diagram 3. U2410B and C is reset when the output of U2350A (output of a 4-input nor gate in conjunction with U2340C) goes low. The proper conditions exist 62  $\mu$ s after the leading edge of line sync and end the blanking interval. The output from U2410B and C, pins 5 and 8, goes to Gen Lock circuitry on Diagram 4 and is used to blank chroma.

Twelve microseconds after the leading edge of line sync, U2440B pin will go low, setting RS flip-flops U2420B and C, 70 IRE pedestal; U2420A and D, 50 IRE pedestal; U2410A and D, chroma; and U2310A and D, setup. These four RS flip-flops enable the VIR Signal pedestal current switches and the sampling gate of U2490 in the VIR Signal detector circuit. Reset of the RS flip-flops takes place on command from timing circuitry on Diagram 1. See Fig. 2-2 for line timing details.

U2550A receives commands for the selected line and field of VIR Signal insertion. When both inputs are low, the high output from pin 1 is routed to U2420A and U2470D to enable the VIR Signal Detector, to U2550B via U2550D to enable the VIR Signal luminance pedestal current switches when the insertion level from U2550C is also low, and to U2450B which is one of three paths providing deletion commands to the Amplifier, Diagram 3. U2450B pin 8 goes low when highs from the Blanking RS flip-flop, the Delete network (U2490F, U2370C and U2370B) and from the VIR Signal line and field selector arrive. The

second deletion command path is U2450A. U2450A receives high inputs from the Blanking RS flip-flop, P2030-2 (trailing edge of line sync), and line 21 timing from Diagram 1. This path provides for deletion of the first half of line 21 when the signal at U2450A pin 4 goes negative after a half line is completed. The third deletion command path is through U2350B, which provides for the deletion of any line from 10 through 21. U2350B gets high inputs from the line selector on Diagram 1, and from the Blanking RS flip-flop. The three paths are combined in U2450C. The output, U2450C pin 12, drives the Amplifier Switch on Diagram 3.

The insertion and deletion of the VIR Signal are controlled by grounding of pins on the rear section REMOTE connector. See Fig. 2-3. In the auto mode, U2490F pin 13 is low, producing a high at U2370A pin 5 and U2370C pin 13. If a VIR Signal is present on the selected line, the VIR Signal Detector will cause a low at pin 8 of U2370B, in turn producing a low at U2450 pin 9. The insertion of a VIR Signal is thus inhibited, but Line 21 half line deletion and selectable line deletion functions are not altered. In the insert mode, P2390-4 as well as P2590-1 is low, overriding the VIR Signal Detector output, deleting any incoming VIR Signal, and inserting the internally generated VIR Signal. If incoming video burst is lost, the level at P2390-5 (from Gen Lock, Diagram 4) will go low, inhibiting the insertion of the VIR Signal unless jumper P2090 is in the CONT position. When jumper P2090 is in the CONT position, a VIR Signal will be inserted, but the chroma portion of the signal will not be phase-locked. In the delete mode, P2390-8 and P2590-1 are low, ultimately causing a high at C2700, inhibiting chroma and also inhibiting the Luminance current switches.

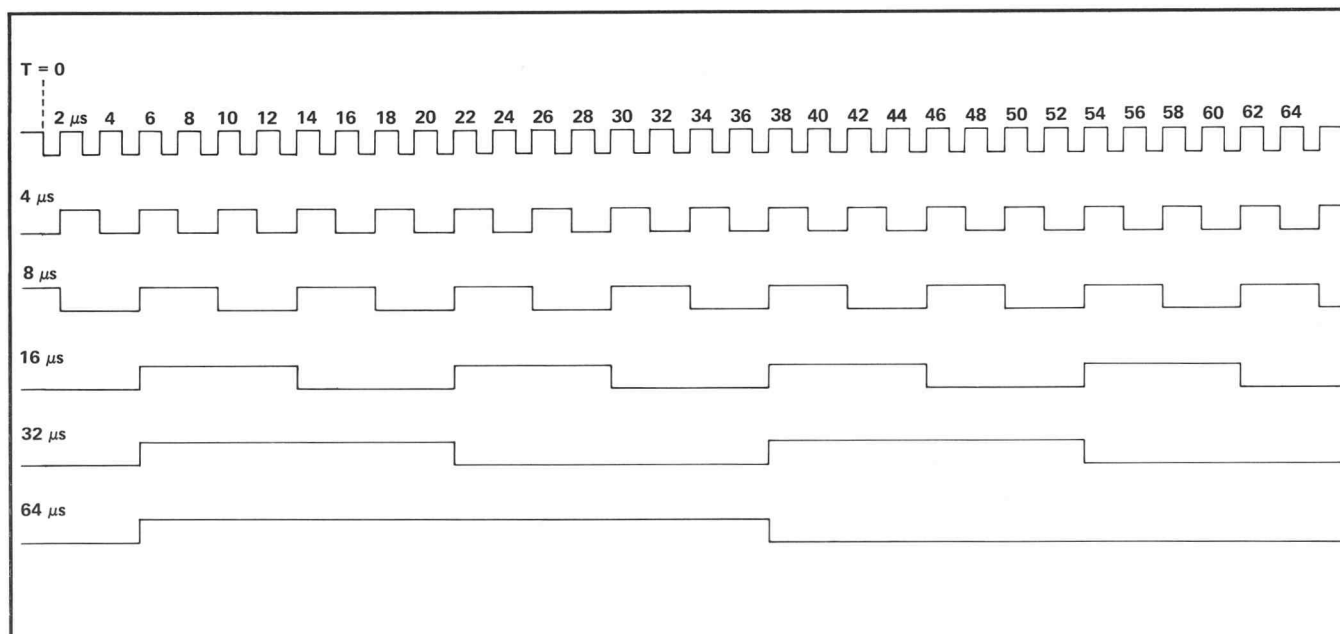


Fig. 2-2. Line Timing details.

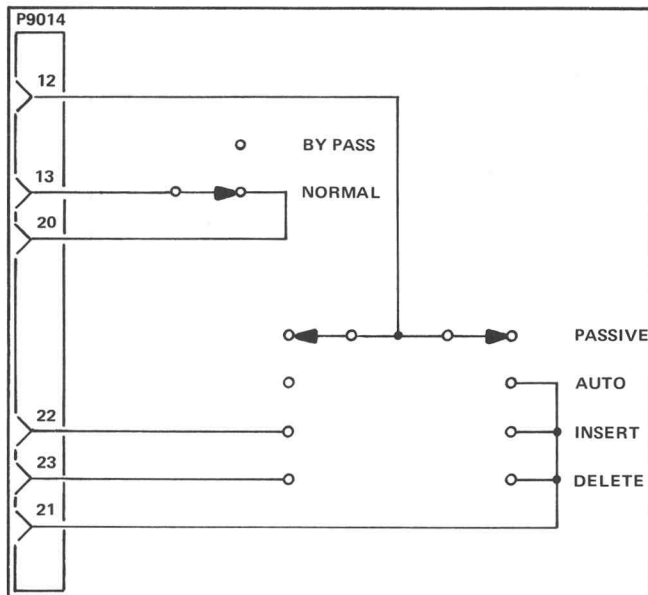


Fig. 2-3. Remote connector wiring

### DIAGRAM 3

The circuitry on Diagram 3 is used to condition the incoming video for VIR Signal insertion and to route the incoming video and internally generated VIR Signal at selected intervals so that a composite is available at the PROGRAM OUT connector.

#### Input Amplifier

The input pre-amplifier is an AC-coupled operational amplifier composed of Q3280-Q3360, using Q3240 as a constant current source. AC coupling removes any DC component that might be applied to the PROGRAM IN. Current through Q3360 flows through R3462 ( $R_f$  of operational amplifier Q3460-Q3470) to set overall circuit gain. The output signal from the emitter of Q3470 is applied to the Program Switch after DC restoration.

#### Back Porch Gate Generator

This stage is used to generate a pulse during back porch time to drive the Back Porch Clamp. The active components are Q3810, (normally on), Q3820, and Q3840.

Q3810 is driven by negative-going reprocessed composite sync. On the trailing edge of each sync pulse, Q3810 turns off. Its current then is shunted by Q3820. A negative-going pulse is produced at the collector of Q3810, differentiated by C3844 and R3844, then applied to the base of Q3840. Q3840 is normally on, so this negative-going pulse does not affect it. Q3810 conducts again after a period of time determined by R3836-C3816, applying a positive-going differentiated pulse to the base of Q3840. Q3840 turns off, producing a negative-going pulse that is delayed from sync, then applied to the back porch clamp to DC restore the program signal during back porch time.

#### Back Porch Clamp

Q3760 is the active element. During back porch time, Q3760 is biased on, effectively grounding C3786. This DC-restores the signal.

#### Program Switch

U3646 is used to route the program signal to the output amplifier, except during VIR Signal insertion. During VIR Signal insertion time, U3646 routes the internally generated VIR Signal to the output amplifier.

U3646 is a dual channel, switchable amplifier with pin 4 performing the switching function. When pin 4 is low, the program signal at pin 2 (via Q3670A) reaches the differential outputs (pin 12 and 13). When pin 4 is high, the internally generated VIR Signal at pin 7 reaches the outputs. Signals reaching the output are also dependent upon the condition of pin 6. If pin 6 is high, there will be no output.

#### Output Amplifier

The Output Amplifier is an operational amplifier driven by current developed by the differential voltage across R3744. This current, through R3732 ( $R_f$  for the amplifier), sets the gain for the stage. The amplifier provides the necessary low impedance to drive the PROGRAM OUT.

### DIAGRAM 4a AND b

The circuitry on Diagrams 4a and 4b provides a 3.58 MHz phase-locked sine wave for use in the modulator, (Diagram 2), the error voltage used to compensate for phase differences between burst and the VIR Signal in the 1441, and the burst lost level used to inhibit VIR Signal insertion when no burst is present. The Gen Lock circuit requires composite video from the Amplifier (Diagram 3), and composite sync from the Sync and Timing board (Diagram 1).

#### Demodulators

Composite video arrives at the Gen Lock Board at P4019-2 and is applied to emitter-follower Q4019. The output of Q4019 feeds a 3.58 MHz series resonant network, L4288-C4384. Q4031 shunts the signal to ground for 50  $\mu$ s during the active video portion of the lines, except for VIR Signal chroma time on the line selected for VIR Signal insertion. This results in all luminance information being removed and only burst and VIR Signal chroma being applied to the demodulators, U4036-U4038. The 3.58 MHz subcarrier from the oscillator circuit arrives at U4038 pin 8 and, after a 90° phase shift (via C4470, L4057, R4450 and C4452), at pin 8 of U4036. The demodulated output at pin 9 of U4038 represents the B-Y component of the input

## Circuit Description—1441

signal and the output at U4036 pin 9 represents the R-Y component. Each demodulated signal is fed to a three-pole low-pass filter that removes high order harmonics generated during demodulation.

The outputs of the low-pass filters drive operational amplifiers; Q4018-Q4017 for the B-Y channel, and Q4016-Q4015 for the R-Y channel. Each has a gain of approximately 30.

### DC Restorers

Q4009 and Q4005 restore the signal to ground during the sync tip by varying the bias the U4036 and U4038 to compensate for level changes in the demodulators. The DC Restorer drive pulse is generated by Q4013 and Q4003 and is derived from composite sync.

Composite sync is applied to emitter-follower Q4001. (The signal is 5 volts in amplitude with the sync tip at 0 volts.) Q4013 is saturated by the sync tip, setting one side of C4140 near ground. The base of Q4003, normally on, goes below  $-14.4$  volts for about  $2\mu\text{s}$ , biasing it off. A 15 volt pulse is generated at the collector of Q4003 and is clamped at  $+0.6$  volts by CR4162. This pulse drives the two clamp transistors, Q4005 and Q4009. The clamp level is also applied to inverting amplifiers U4017A and U4017B to drive the bias inputs of the demodulators. This sets the demodulator outputs at 0 volts at a time when subcarrier should be minimum.

### Vir Signal Phase Error Sampler

Q4011 and U4031 sample phase errors between burst and the VIR Signal and apply correction to circuitry in the Modulator (Diagram 2).

Q4011 receives a gating signal from the Modulator and applies it to U4031, which is connected in a "sample and hold" configuration. U4031 then samples the R-Y channel, where burst and VIR Signal chroma phase should be identical. A phase difference between the burst and VIR Signal at the 1441 output will show up as a voltage pulse in the R-Y channel, proportional to the phase difference. This pulse will cause a change in level at the output of U4031. This level, applied to varicap CR2994 on Diagram 2, varies the phase shift introduced by the varicap and corrects the phase error. Output impedance of U4031 is extremely high; the loading caused by a  $10\text{ M}\Omega$  probe can cause the phase lock loop to lose control of the VIR Signal phase.

### Burst Sample Gate

Q4012 and Q4032 generate a gate at the trailing edge of sync to drive the burst clamp gates. Q4012 is held near saturation by R4240 and CR4364. The positive-going

trailing edge of sync turns Q4012 off, causing the collector of Q4012 to fall about  $+2$  volts before C4236 discharges through R4240. The falling edge of the Q4012 output signal is slowed by C4230, providing about  $1\mu\text{s}$  delay before Q4032 turns off. When Q4032 turns off, it applies a gate to the cathode of CR4336 and the emitter of Q4042, turning them on. The demodulated B-Y component of burst is applied to the anode of CR4336. The summation of these two signals causes the collector of Q4042 to be at its lowest point at the center of burst. This negative-going signal, coupled through Q4043 and Q4430, turns Q4052 on which applies a burst sample gate to Q4062 and Q4064. The demodulated B-Y component of burst passes through Modulator Drive Q4062 to the negative input (pin 6) of Schmitt connected amplifier U4074B. Pin 7 of U4074B goes to  $+5\text{ V}$ , (clamped by CR4532) and supplies positive level required by Modulator circuitry on Diagram 2.

### Subcarrier Oscillator

The demodulated R-Y component of burst passes through Q4064 to the positive input (pin 3) of error amplifier U4074A. The level at pin 1 of U4074A controls the phase and frequency of the subcarrier oscillator by varying the effective capacitance of CR4568. The Subcarrier Oscillator, Q4067-Q4077, is similar to a Colpitts oscillator, where Y4067 appears as the inductive component. The oscillator output passes through a filter to operational amplifier Q4068-Q4069, which applies a 1 volt peak-to-peak 3.58 MHz sine wave to the Gen Lock demodulators and Modulator circuitry on Diagram 2.

## DIAGRAM 5

The Low Voltage Power Supply circuit provides three regulated supplies;  $+5$  volts, and  $-15$  volts. Electronic regulation is used to provide stable, low ripple output voltages. All the supplies are current-limited to prevent instrument damage in the event that a supply is shorted to ground. The primary circuit of the transformer can be connected to be operated from either a 115 VAC nominal line voltage source or a 230 VAC nominal line voltage source.

### $-15\text{ V}$ Supply

The  $-15$  volt supply provides the reference voltage for the  $+5$  and  $+15$  volt supplies. The reference for the  $-15$  volt supply is a 9.1 volt zener diode, VR9850.

The output from the secondary winding (pins 6 and 7 of T9001) is rectified by a full-wave rectifier consisting of CR9870, CR9872, CR9874, and CR9876. The rectified voltage is filtered by C9061 and applied through a  $-15$  volt series regulator, Q9085, to the load. Series regulator Q9085 and its driver, Q9850, are controlled by a voltage comparator consisting of Q9854 and Q9856 with associated

components. C9852 filters any noise generated by the -15 volt reference, VR9850.

Q9852 and associated components, is an overload protection circuit. During excessive load current, Q9852 (normally off) turns on, which turns Q9850 and Q9085 off, disconnecting the -15 volt supply.

### +5 and +15 Volt Supplies

Both supplies are similar to the -15 volt supply.

## DIAGRAM 6

The circuitry on Diagram 6 is used to route the PROGRAM IN signal to the PROGRAM OUT in the event of loss of power or instrument malfunction, or to the active circuits for further processing before applying the processed signal to the PROGRAM OUT. The interface, J-P 9010, provides signal connection between front and rear sections of the 1441. The REMOTE connector, J-P 9014, provides access for remote operation. See Operating Instructions, Section 1.

The L-C network between pins 1 and 5 of the relay provides signal delay approximately equal to that of the active circuitry.



# MAINTENANCE AND CALIBRATION

This section of the manual contains information for use in maintenance and calibration of the 1441 as follows:

## Maintenance

**Preventive Maintenance:** Cleaning, lubrication, visual inspection, etc.

**Troubleshooting:** Aids for isolating trouble to a particular stage, etc.

**Corrective Maintenance:** Replacement procedures and parts ordering information.

## Calibration

**Test Equipment Required:** A list of recommended test equipment used to calibrate the 1441.

**Procedure:** Step-by-step instructions for returning the 1441 to specification.

**Exterior.** Loose dirt accumulated on the outside of the 1441 can be removed with a soft cloth or small paint brush. The paint brush is particularly useful for dislodging dirt on the front panel. Dirt that remains can be removed with a soft cloth dampened in a solution of water and mild detergent. Abrasive cleaners should not be used.

**Interior.** Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high-humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry, low velocity air. Remove any dirt which remains with a soft paint brush or a cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

## Lubrication

The reliability of switches and other moving parts can be maintained if they are kept properly lubricated. Use a cleaning-type lubricant (e.g., Tektronix Part No. 006-0172-00) for switch contacts. This lubricant does not affect the electrical characteristics of the switch. To lubricate the switch detent, use a heavier lubricant (e.g., Tektronix Part No. 006-0219-00). Do not overlubricate.

## Visual Inspection

The 1441 should be inspected occasionally for such defects as broken connections, loose or disconnected pin connectors, improperly seated solid-state devices, damaged circuit boards and heat-damaged components.

The correct procedure for most defects is obvious; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent recurrence of the damage.

## Transistor and Integrated Circuit Checks

Periodic checks of the transistors and integrated circuits (IC's) used in the 1441 are not recommended. The best indication of performance is the actual operation of the component in the circuit. Performance of the circuit is thoroughly checked when performing either the performance check or calibration procedure. Any substandard transistors or integrated circuits will usually be detected at that time.

## MAINTENANCE

### PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, and lubrication. Preventive maintenance performed on a regular basis may prevent instrument breakdown, and will improve the reliability of this instrument.

### Cleaning

**General.** The 1441 should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket that prevents efficient heat dissipation. It also provides an electrical conduction path.

### CAUTION

*Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Avoid chemicals which contain benzene, toluene, xylene, acetone, or similar solvents.*



## TROUBLESHOOTING

The following information is provided to facilitate troubleshooting of the 1441. Information contained in other sections of this manual should be used along with the following information to aid in locating the defective component. An understanding of the circuit operation is very helpful in locating troubles.

## Troubleshooting Aids

**Diagrams.** Circuit diagrams are provided on foldout pages at the rear of this manual. Each component, its electrical value and circuit number are shown on the diagrams. In addition, typical voltages which can be expected are also shown.

Each diagram has been assigned a diagram number and name. For example, the first diagram has been assigned the number 1 and is called SYNC LOCK & VERTICAL TIMING. Notice the solid blue line that surrounds the circuitry on this diagram. This line is used to identify a particular circuit board on which the components are physically located. This reference allows for correlation between the diagrams, circuit boards, and electrical parts list.

**Circuit Boards.** The Adjustment pull-out page in the diagram section shows the location of each circuit board within the instrument. In addition, each circuit board is shown (full view) opposite the appropriate diagram in the diagram section. Each electrical component on the board is identified by its circuit number. In most cases, these circuit numbers were assigned on a grid system as a convenience to the user of the instrument. For example, notice the circuit board photo opposite diagram 1. The upper left hand corner of this board has been assigned numbers around 1000. Proceeding left to right, the numbers go towards 1100 at the upper right hand corner. From top to bottom, the numbers increase to 1900 at the bottom left corner and 1999 at the bottom right corner. Using this method, the physical location of each component is readily available.

**Waveforms.** Important waveforms (typical) are given opposite the appropriate diagram in the diagram section. These waveforms aid in determining if a circuit is functioning properly.

**Wire Color Codes.** All insulated wires in the 1441 are color coded to facilitate circuit tracing. Table 3-1 summarizes the coding system used in the 1441.

**Resistor Color Code.** In addition to the brown composition resistors, metal film resistors (identified by their gray or light blue color) are used in the 1441. The resistance

values of composition and metal film resistors are color-coded on the components with the standard EIA color code.

TABLE 3-1

Color Code	Significance
Black	Chassis Ground
White on Black	Floating Ground
Yellow on Green	Safety Ground
Gray <sup>1</sup>	AC Line
White <sup>1</sup>	Signal
Red <sup>2</sup>	B+
Violet <sup>2</sup>	B—

**Capacitor Marking.** The capacitance value of a common disc capacitor or small electrolytic is marked in microfarads on the side of the component body. The white ceramic capacitors used in the 1441 are color-coded in picofarads using a modified EIA code. The new "tear drop" capacitors are color-coded in microfarads using a modified EIA code, with the dot indicating both voltage and the positive (+) side.

## Troubleshooting Techniques

This troubleshooting procedure is arranged in an order which checks the simple possibilities before proceeding with extensive troubleshooting.

**1. Check Control Settings.** Incorrect control settings can indicate trouble that does not exist. If there is any question about the correct function or operation of any control, see the Operating Instructions.

**2. Check Operation of Associated Equipment.** Many times malfunction of equipment can be traced to associated equipment.

**3. Visual Check.** Visually inspect the portion of the instrument in which the trouble is located. Look for unsoldered connections, loose pin connectors, broken wires, damaged circuit boards, damaged components, etc.

**4. Check Circuit or Instrument Calibration.** The apparent trouble may only be a result of misadjustment and may be corrected by calibration. Complete calibration instructions are given in this section.

<sup>1</sup> Color Stripes are used on these wires as an aid to circuit tracing.

<sup>2</sup> Color Stripe on wire indicates position of supply with respect to 0 volts (e.g., a black stripe on a red wire would be the first voltage in the positive direction). If a second stripe is used (white only), this indicates a non-regulated supply.



**5. Isolate Trouble to a Circuit.** To isolate trouble to a circuit, note the trouble symptoms. The symptoms often identify the circuit in which the trouble is located. When trouble symptoms appear in more than one circuit, check affected circuits by taking voltage and waveform readings.

Incorrect operation of all circuits often indicates trouble in the power supply. Check first for correct voltage of the individual supplies. A defective component elsewhere in the circuit can also appear as a power supply trouble, and affect the operation of other circuits.

The Circuit Description section of this manual can be used as a guide for isolating a trouble. This description explains how the various signal components are combined to form the video signal. By checking the signals at the BNC connectors, it is possible to determine circuits that are functioning properly and those that are not.

When a trouble is isolated to the smallest possible area, proceed with steps 6 through 8 in this troubleshooting procedure to locate the defective component(s).

**6. Check Circuit Board Interconnections.** After the trouble has been isolated to a particular area or circuit, check the pin connectors on the circuit board for correct connection.

The pin connectors used in this instrument also provide a convenient means of circuit isolation. For example, a short in a power supply can be isolated by disconnecting the power distribution pin connectors for the voltage at the Power Supply board when making resistance to ground checks.

**7. Check Voltage and Waveforms.** Often the defective component can be located by checking for the correct voltage or waveform in the circuit. Typical voltages and waveforms are given in the Diagrams section.

#### NOTE

*Voltages and waveforms given on the diagrams are not absolute and may vary slightly between instruments.*

#### CAUTION

*Due to the component density on the circuit boards, care should be taken with meter leads and probe tips. Accidental shorts can cause abnormal voltages or transients which may destroy many components.*

#### WARNING

*"Ground lugs" are not always at ground potential. Check the diagrams before using such connections as a ground for the voltmeter test prod or oscilloscope probe. Some transistor cases may be elevated.*

**8. Check Individual Components.** The following procedures describe methods of checking components in the 1441. Components which are soldered in place should be checked without removal, by isolating the component if circuit conditions allows. If component isolation is questionable unsolder one end.

a. Transistors (excluding FETs, Field Effect Transistors). The best check of transistor operation is actual performance under operating conditions. If a transistor is suspected of being defective, it can best be checked by substituting a new transistor. However, be sure that circuit conditions are not such that a replacement might also be damaged. If substitute transistors are not available, use a dynamic tester such as the Tektronix Type 576.

b. Diodes. A diode can be checked for an open or shorted condition by measuring the resistance between terminals.

#### CAUTION

*Do not use an ohmmeter range that has a high internal current. High current may damage the diodes.*

**9. Repair and Readjust the Circuit.** If any defective component or part is located, follow the replacement procedure given in this section. Be sure to check the performance of any circuit that has been repaired or that has had any electrical components replaced.

## CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques or procedures required to replace components in this instrument are described here.

### Obtaining Replacement Parts

All electrical and mechanical replacement parts for the 1441 can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before

purchasing or ordering replacement parts, consult the Parts List for value, tolerance, and rating.

#### NOTE

*When selecting replacement parts, it is important to remember that the physical size and shape of a component may affect its performance at high frequencies.*

**Multiple Terminal Connector Holders.** Most inter-circuit connections between the circuit boards, or between the boards and chassis mounted components, are made through pin connectors. The terminals in the connector holder are identified with numbers. Connector orientation to the circuit board is keyed with triangles, one on the holder and one on the circuit board. See Fig. 3-1.

**Circuit Boards.** If the circuit board is damaged beyond repair, the entire assembly including all soldered-on components can be replaced.

**Transistor and Integrated Circuit Replacement.** Transistors and integrated circuits, (IC's) should not be replaced unless they are actually defective. Replacement or exchange of components may affect the calibration of the instrument. If a transistor or integrated circuit is removed during routine maintenance, return it to its original socket.

Any replacement component should be of the original type or a direct replacement. Bend the leads to fit the socket and cut the leads to the same length as on the component being replaced. See Fig. 3-2 for basing diagrams.

After any component is replaced, check the operation and calibration of the associated circuits.

**Switches.** If a switch is defective, replace the entire assembly. Replacement switches can be ordered by referring to the Part List for the applicable part numbers.

**Power Transformer Replacement.** If the power transformer becomes defective, contact your local Tektronix Field Office or representative for replacement. Replace only with a direct replacement Tektronix transformer.

**Power Input Connector and RFI Filter Replacement.** The Power Input Connector and RFI Filter is replaceable as a unit and repair should not be attempted. If replacement is necessary, observe proper polarity to assure instrument protection.

The narrow blade (terminal number 4) should show continuity to terminal number 3, which connects to fuse F9201, see diagram 5. (The filter contains an internal non-replaceable fuse between these two terminals.) Use care when soldering to terminals numbers 1 and 3, as excess solder could possibly short the filter case.

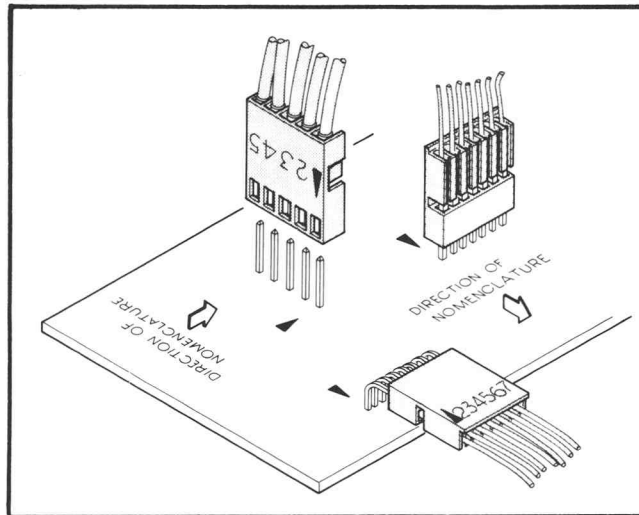


Fig. 3-1. Multipin Circuit Board Connectors.

## CALIBRATION

This section of your manual is provided as a guide for recalibration of the 1441. Limits and tolerances in the procedure are given as guides and are not instrument specifications unless given in the Specification portion of the manual. Adjustment locations are on a pull-out page in the Diagrams Section of this manual.

### TEST EQUIPMENT REQUIRED

1. Test oscilloscope. Bandwidth, DC to 30 MHz; minimum deflection, 1 mV/div; two input channels with provisions for independent or differential operation. For example, a Tektronix Type 547 Oscilloscope with a Type 1A5 Plug-In Unit was used for the procedure.
2. Voltage Control Unit. For example, General Radio W10MT3W Metered Variac Autotransformer.
3. Video Signal Source. For example, a Tektronix Type 147 was used for the procedure.
4. Vectorscope. For example, a Tektronix Type 520A was used for the procedure.

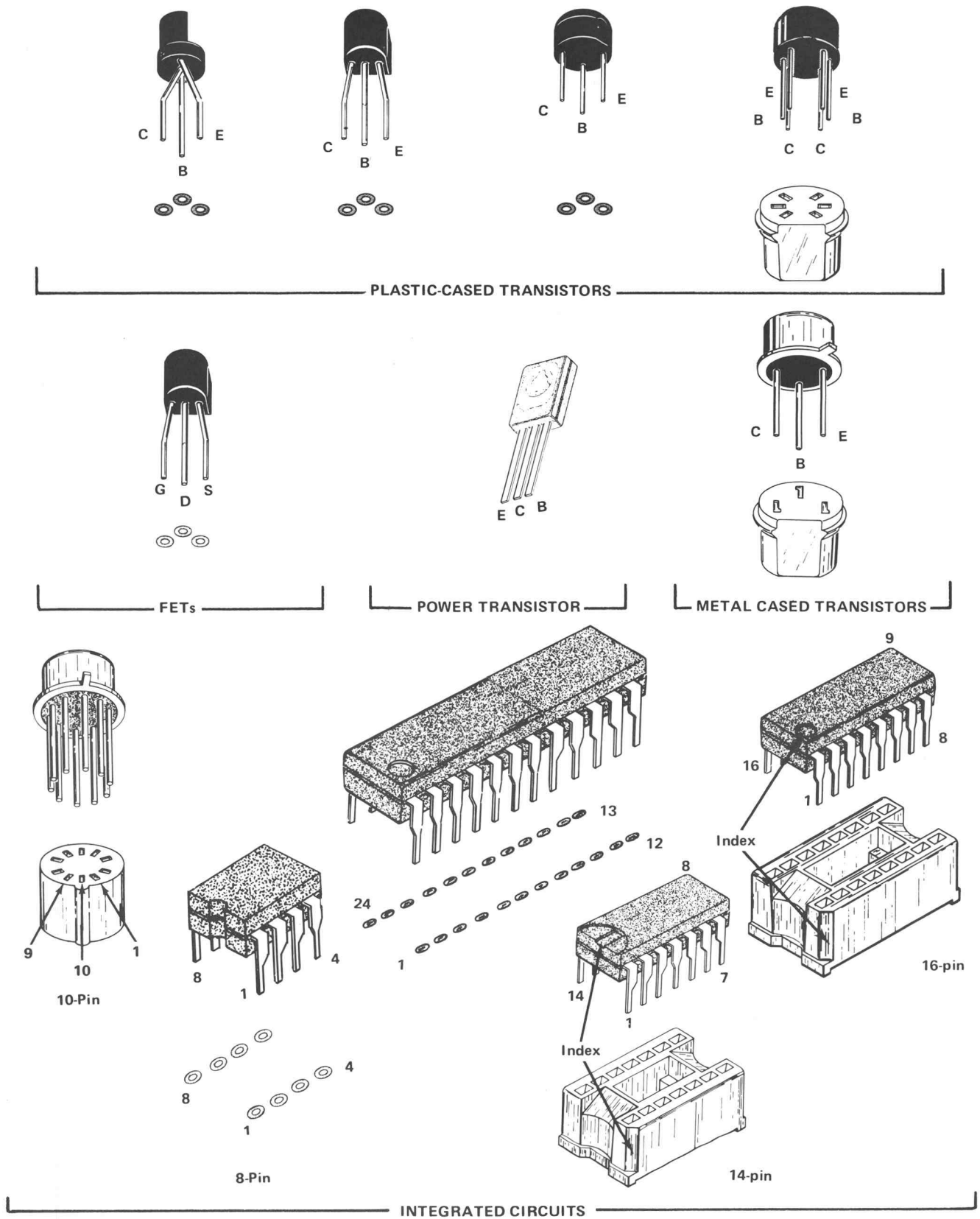


Fig. 3-2. Transistor and Integrated Circuit Basing Diagram.

## Maintenance and Calibration—1441

5. Constant Amplitude Signal Generator. For example, a Tektronix Type 191 was used for the procedure.

6. RMS Voltmeter. Must be capable of measuring 70 mV RMS within 1%; must be capable of indicating dB accurate to 1 dB. For example, a Hewlett-Packard Model 3400A.

7. DC Voltmeter, Accuracy, within 0.1%. For example Fluke Model 825A.

8. Return Loss Bridge. Tektronix Part No. 015-0149-00.

9. Minimum Loss Attenuator. Tektronix Part No. 011-0057-00.

10. Cables (3), 75  $\Omega$ . Tektronix Part No. 012-0074-00.

11. Termination, 75  $\Omega$  end-line. Tektronix Part No. 011-0102-00.

12. Termination, 75  $\Omega$  feed-through. Tektronix Part No. 011-0103-00.

13. 5 MHz Low Pass Filter. Tektronix Part No. 015-0213-00.

14. Weighting Network. Tektronix Part No. 015-0215-00.

15. Adapter, GR to BNC Female. Tektronix Part No. 017-0063-00.

16. Cable. Tektronix Part No. 012-0001-00.

17. 10X Probe. For example, Tektronix P6008 Probe. Tektronix Part No. 010-0129-00.

18. 1X Probe. For example, Tektronix P6011 Probe. Tektronix Part No. 010-0190-00.

### GROUP 1—POWER SUPPLIES

#### 1. Setup

a. Connect 1441 to the Metered Variac Autotransformer.

#### 2. Check/Adjust —15 V Power Supply

a. Connect the DC Voltmeter between ground and the —15 V supply.

b. Check—should be —15 V  $\pm 1\%$ .

c. Adjust R9851 —15 V Adj. for —15 V.

#### 3. Check/Adjust +15 V Power Supply

a. Connect the DC Voltmeter between ground and the +15 V supply.

b. Check—should be +15 V  $\pm 1\%$ .

c. Adjust R9831 +15 Adj. for +15 V.

#### 4. Check/Adjust +5 V Power Supply

a. Connect the DC Voltmeter between ground and the +5 V supply.

b. Check—should be +5 V  $\pm 1\%$ .

c. Adjust R9801 +5 V Adj. for +5 V.

### 5. Check Power Supply Regulation

a. Check all supplies for 10 mV or less ripple as the Line Voltage is varied between 90 V RMS and 132 V RMS.

b. Remove the 1441 from the Metered Variac Autotransformer and connect it to a suitable power source.

## GROUP 2—TIMING

#### 1. Check/Adjust Sync Lock

a. Connect a 1 V P-P Modulated Staircase comp video signal from the video source generator to the 1441 PROGRAM LINE IN.

b. Connect a 10X probe between the test oscilloscope and TP1171. Externally trigger the test oscilloscope from the video source comp sync. Observe the display at a horizontal rate (10  $\mu$ s/div).

c. Check—display should be a trapezoidal waveform with an aberration centered on the leading edge.

d. Adjust L1367 (1 MHz Osc.) to center the aberration on the leading edge of the trapezoidal waveform.

## 2. Check Sync Stripper

a. Connect a 10X probe between the test oscilloscope and pin 2 of P1690.

b. Check—display should be comp sync of 5 V to 6 V amplitude and 4.7  $\mu$ s width.

## GROUP 3—DIFF PHASE AND DIFF GAIN

### 1. Check/Adjust Diff Phase

a. Connect the PROGRAM LINE OUT to the vector-scope input.

b. Set the vectorscope to measure differential phase.

c. Check—differential phase should be  $\leq 0.15^\circ$ .

d. Adjust R3850 (Diff Phase) for best differential phase.

### 2. Check DIFF Gain

a. Set the vectorscope to measure differential gain.

b. Check—differential gain should be  $\leq 0.2\%$ .

## GROUP 4—MOD BALANCE

### 1. Check/Adjust Modulator Balance

a. Connect the 1441 PROGRAM OUT to the test oscilloscope vertical input.

b. Remove P1808 connector and connect it to ground.

c. Set P2050 jumper to the BOTH modes position. The VIR Signal should appear on every line.

d. Check—subcarrier on the gray and setup levels of the VIR Signal, should be less than 2.5 mV.

e. Adjust R2950 and C2938 (Mod Bal.) for minimum subcarrier on the gray and setup levels.

## GROUP 5—VIRS

### 1. Check/Adjust Chroma Gain

a. Check VIRS chroma amplitude. Should be 40 IRE within 0.4 IRE.

b. Adjust R2722 (Chroma Amp) for 40 IRE of VIRS chroma.

### 2. Check/Adjust VIRS Chroma Envelope

a. Turn off video signal source burst. Place P2090 in the CONT. position.

b. Display the 1441 PROGRAM LINE OUT on the test oscilloscope.

c. Check—chroma envelope risetime should be 1  $\mu$ s  $\pm 15\%$ .

d. Adjust L2810 and L2820 for best envelope front corner and risetime.

### 3. Check/Adjust VIRS Luminance

a. Turn on video signal source burst. Remove Q2720 to delete the VIRS chroma envelope.

b. Check—7.5 IRE set up level for 7.5 IRE  $\pm 0.5$  IRE.

c. Adjust R2510 for 7.5 IRE setup level.

d. Check—gray level should be 50 IRE  $\pm 0.5$  IRE.

e. Adjust R2526 for 50 IRE gray level.

f. Check—Average level should be 70 IRE  $\pm 0.7$  IRE.

g. Adjust R2528 for 70 IRE average level.

h. Check—Luminance pedestal risetime should be 250  $\mu$ s  $\pm 7.5$   $\mu$ s.

i. Adjust L2604 and L2628 for minimum ringing and best risetime.

## Maintenance and Calibration—1441

- j. Replace Q2720. Change video signal source signal to 100 IRE Flat Field.

### GROUP 6—INSERT DELAY

#### 1. Check/Adjust Insert Delay

- a. Display the 1441 PROGRAM OUT VIR Signal on the waveform monitor.
- b. Check—there should be  $12\mu\text{s}$  between the leading edge of sync and the average pedestal riser.
- c. Adjust R1001 for  $12\mu\text{s}$  between the leading edge of sync and the average pedestal riser.
- d. Check—there should be  $\geq 0.5\mu\text{s}$  range of control on either side of optimum.
- e. Display the waveform at the collector of Q1445 on the test oscilloscope.
- f. Check—display should be a ramp of at least  $7.0\mu\text{s}$  duration with an amplitude of 4 V to 5.5 V.
- g. Replace P1808 connector on Line 20.

### GROUP 7—GEN-LOCK

#### 1. Adjust Burst Amplitude

- a. Display the waveform at the source of Q4005 on the test oscilloscope.
- b. Adjust L4057 for maximum color burst amplitude.
- c. Display the 1441 PROGRAM OUT on the vector-scope. Adjust vectorscope gain to set the burst and VIR Signal vectors on the calibrated graticule edge.

#### 2. Check/Adjust Phase Shift with Burst Amplitude Change

- a. Check phase shift of VIR Signal as video signal source burst amplitude is changed to 20 IRE, ( $\leq 1^\circ$ ) and as burst amplitude is changed from 40 IRE to 80 IRE ( $\leq 1^\circ$ ).
- b. Adjust R4084 for minimum VIR Signal phase shift as video signal source burst amplitude is varied from 40 IRE to 20 IRE and from 40 IRE to 80 IRE.

#### 3. Check Phase Shift with Burst Frequency Change

- a. Check phase shift of VIR Signal as video signal source burst frequency is varied  $\pm 10$  Hz from 3.579545 MHz. Should be  $\leq 1^\circ$  with frequency change of 10 Hz.

#### 4. Check/Adjust VIR Signal Phase

- a. With the vectorscope in Vector mode, use the Calibrated Phase control to check the VIR Signal phase with respect to burst. Should be  $\leq 0.25^\circ$  difference.
- b. Adjust R4025 for overlay of burst and VIR Signal vectors. Check range of control for at least  $5^\circ$  on either side of overlay.

### GROUP 8—OPERATING MODES

#### 1. Check 1/2 Line Deletion

- a. Display line 20 of the 1441 PROGRAM OUT on the waveform monitor. Program the video signal source for a VIT Signal on line 21 of the vertical interval.
- b. Move P2070 to the "21" position.
- c. Check—the first half of the VIT Signal on line 21 should be deleted in both fields.

#### 2. Check Full Line Deletion

- a. Program the video signal source for a VIT Signal on Line 15.
- b. Program the 1441 for deletion of line 15 (green on white wire connected to P1808).
- c. Check—incoming VIT Signal should have been deleted. Check all lines 15 through 21.
- d. Store this wire on P1600-1 until needed.

#### 3. Check BURST-CONT Mode

- a. Remove the color burst from the video signal source signal.
- b. Check—with P2090 in BURST position, no VIR Signal will be inserted. With P2090 in CONT position the VIR Signal will be inserted. Leave P2090 in BURST mode; restore burst to video signal source signal.

## GROUP 9—VIR SIGNAL INSERTION

### 1. Check/Adjust Insertion DC Level

a. Display the vertical interval from the 1441 PROGRAM OUT on the test oscilloscope.

b. Check—the blanking level of the inserted line should be within 5 mV of the blanking level of a non-inserted line.

c. Adjust R3720 to match the two blanking levels.

### 2. Check/Adjust PROGRAM DC Level

a. Check—the blanking level of the PROGRAM OUT should be 0 V within 50 mV.

b. Adjust R3718 (Program DC Level) for 0 V at the blanking level.

### 3. Check/Adjust PROGRAM Gain

a. Check—video signal source video amplitude with the 1441 bypassed (POWER OFF).

b. Check—1441 PROGRAM OUT signal amplitude (POWER ON) should be equal to that noted in part a, within 0.5%.

c. Adjust R3282 to match the 1441 PROGRAM OUT signal amplitude to the video signal source amplitude.

### 4. Check/Adjust Multiburst Flatness

a. Program the video signal source for a multiburst signal.

b. Display the 1441 PROGRAM OUT on the waveform monitor.

c. Check—Tilt on the multiburst signal (as measured between the first and the last packets) should match the input multiburst signal (as checked with the 1441 bypassed) within 1%.

d. Change the video signal source signal to 0 APL flatfield.

e. Check—TTL transients should be no more than 5 mV.

f. Adjust R3620 for minimum TTL transients.

g. Adjust C3660 for a match of multiburst flatness between bypass and operating modes.

### 5. Check Pulse to Bar Ratio

a. Program the video signal source for a composite signal containing a 2T Pulse, a 12.5T Modulated Pulse, and a bar.

b. Display the 1441 PROGRAM OUT on the test oscilloscope.

c. Check—Pulse to bar ratio should be within 0.25% for the 2T Pulse and 0.5% for the 12.5T Pulse as referenced to the signal in the bypass mode.

d. Display the 1441 PROGRAM OUT on the waveform monitor.

e. Check—Change of baseline ripple of the 12.5T modulated pulse should not be more than 0.5% between bypass and operate.

### 6. Check Waveform Tilt

a. Display the video signal source rear-panel full field signal on one channel of the test oscilloscope; display the 1441 PROGRAM OUT (as driven by the video signal source front-panel full field signal) on the other channel of the test oscilloscope.

b. Program the video signal source for a signal that includes a 26  $\mu$ s bar.

c. Check—Waveform tilt, measured differentially, for 0.25% or less, comparing the bypassed display to the operating display.

d. Program the video signal source for a field square wave.

e. Check—Waveform tilt, measured differentially, for 0.5% or less, comparing the bypassed display to the operating display.

### 7. Check Short Time Waveform Distortion

a. Program the video signal source for a Sin<sup>2</sup> Pulse and Bar signal with a 2T Pulse.

## Maintenance and Calibration—1441

b. Display the 1441 PROGRAM OUT on the waveform monitor.

c. Check—Overshoot of the 2T Pulse must not exceed 1%.

d. Program the video signal source for a  $\text{Sin}^2$  Pulse and Bar signal with a T Pulse.

e. Check—Overshoot of the T pulse must not exceed 2%.

### 8. Check PROGRAM OUT Aberrations

a. Program the video signal source for a 0 APL flatfield signal.

b. Display the 1441 PROGRAM OUT on the test oscilloscope using a 3.58 MHz pass filter.

c. Check—Residual subcarrier should be  $-60$  dB (0.7 mV) or less on lines 10 through 19, and line 21.

d. Display the 1441 PROGRAM OUT on the test oscilloscope using the 5 MHz Low Pass Filter.

e. Check—All blanking lines and inactive parts of lines, except line 20, should have no signals greater than  $-40$  dB (7 mV).

f. Display the 1441 PROGRAM OUT on the test oscilloscope using the 5 MHz Noise Weighting Network and the 5 MHz Low Pass Filter.

g. Check—Hum and power line related transients should not exceed  $-60$  dB (0.7 mV).

h. Display Field 1 Line 19 of the 1441 PROGRAM OUT using 5 MHz Low Pass Filter on the test oscilloscope.

i. Program the video signal source for a VIT Signal on Line 19.

j. Program the 1441 to delete Line 19.

k. Check—signal attenuation should be as follows:

2T Pulse	$-70$ dB ( $\leq 0.22$ mV)
Color Bar subcarrier	$-60$ dB ( $\leq 0.7$ mV)

l. Remove the incoming program signal, terminate PROGRAM IN in  $75\ \Omega$ , and connect +15 V to P3890-2.

m. Display PROGRAM OUT on the test oscilloscope using the 5 MHz Noise Weighting Network, and 5 MHz Low Pass Filter.

n. Check—The random noise output should not exceed  $-75$  dB (0.14 mV).

## GROUP 10—RETURN LOSS

### 1. Check Input Return Loss

a. See return loss bridge manual for details.

b. Check input return loss with the Return Loss Bridge Unknown arm on the 1441 PROGRAM IN connector and the  $75\ \Omega$  termination on the PROGRAM OUT connector, POWER off for at least  $-40$  dB ( $\leq 2.5$  mV) 50 kHz to 5 MHz.

c. Check input return loss with power on without termination of the PROGRAM OUT, for  $-46$  dB, ( $\leq 1.25$  mV) 50 kHz to 5 MHz.

### 2. Check Output Return Loss

a. Check PROGRAM OUT return loss as above for  $-30$  dB ( $\leq 7.9$  mV).



# ELECTRICAL REPLACEABLE PARTS LIST

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number  
00X Part removed after this serial number

## ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 has been utilized where possible.

## ABBREVIATIONS AND REFERENCE DESIGNATORS

A	ASSEMBLY, SEPARABLE OR REPAIRABLE	P	CONNECTOR, MOVABLE PORTION
ASSY	ASSEMBLY	PLSTC	PLASTIC
C	CAPACITOR, FIXED OR VARIABLE	PWR	POWER
CER	CERAMIC	Q	TRANSISTOR OR SILICON-CONTROLLED RECTIFIER
CKT	CIRCUIT	R	RESISTOR, FIXED OR VARIABLE
COMP	COMPOSITION	RECP	RECEPTACLE
CONN	CONNECTOR	RES	RESISTOR
CR	DIODE, SIGNAL OR RECTIFIER	S	SWITCH
DS	INDICATING DEVICE (LAMP)	SEL	SELECTED
ELECT	ELECTRICAL	T	TRANSFORMER
ELCTLT	ELECTROLYTIC	U	ASSEMBLY, INSEPARABLE OR NON-REPAIRABLE
F	FUSE	VAR	VARIABLE
FIL RAD	FILTER, RADIO	VARICAP	VARIABLE CAPACITANCE
FXD	FIXED	VR	VOLTAGE REGULATOR (ZENER DIODE, ETC.)
INTFER	INTERFERENCE	XFMR	TRANSFORMER
J	CONNECTOR, STATIONARY PORTION	Y	CRYSTAL
K	RELAY		
L	INDUCTOR, FIXED OR VARIABLE		
NONWIR	NOT WIRE WOUND		

# CROSS INDEX

## MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY, STATE, ZIP
00853	Sangamo Electric Co., S. Caroline Div.	P. O. Box 128	Pickens, SC 29671
01002	General Electric Co., Industrial and Power Capacitor Products Dept.	John St.	Hudson Falls, NY 12839
01121	Allen-Bradley Co.	1201 2nd St.	Milwaukee, WI 53212
01281	TRW, Inc., Semiconductor Div.	14520 Aviation Blvd.	Lawndale, CA 90260
01295	Texas Instruments, Inc., Components Group	P. O. Box 5012	Dallas, TX 75222
02660	Bunker-Ramo Corp., The, Amphenol Connector Div.	2801 S. 25th Ave.	Broadview, IL 60153
02735	RCA Corp., Solid State Division	Route 202	Somerville, NJ 08876
04713	Motorola, Inc., Semiconductor Products Div.	5005 E. McDowell Rd.	Phoenix, AZ 85008
05397	Union Carbide Corp., Materials Systems Division	11901 Madison Ave.	Cleveland, OH 44101
07263	Fairchild Semiconductor, A Div. of Fairchild Camera and Instrument Corp.	464 Ellis St.	Mountain View, CA 94040
07910	Teledyne Semiconductor	12515 Chadron Ave.	Hawthorne, CA 90250
08806	General Electric Co., Miniature Lamp Dept.	Nela PK.	Cleveland, OH 44112
09353	C and K Components, Inc.	103 Morse Street	Watertown, MA 02172
18324	Signetics Corp.	811 E. Arques	Sunnyvale, CA 94086
24931	Specialty Connector Co., Inc.	3560 Madison Ave.	Indianapolis, IN 46227
27014	National Semi-Conductor Corp.	2950 San Ysidro Way	Santa Clara, CA 95051
29587	Bunker-Ramo Corp., The, Amphenol Industrial Div.	1830 S. 54th Ave.	Cicero, IL 60650
32436	Syscon International, Inc.	205 Sycamore St.	South Bend, IN 46622
56289	Sprague Electric Co.		North Adams, MA 01247
71400	Bussman Mfg., Division of McGraw-Edison Co.	2536 W. University St.	St. Louis, MO 63107
71482	Clare, C. P., and Co.	3101 Pratt Blvd.	Chicago, IL 60645
71785	TRW Electronic Components, Cinch Div.	1501 Morse Ave.	Elk Grove Village, IL 60007
72136	Electro Motive Mfg. Co., Inc., The	South Park and John Streets	Willimantic, CT 06226
72982	Erie Technological Products, Inc.	644 W. 12th St.	Erie, PA 16512
73138	Beckman Instruments, Inc., Helipot Div.	2500 Harbor Blvd.	Fullerton, CA 92634
73445	Amperex Electronic Corp.	230 Duffy Ave.	Hicksville, L. I., NY 11802
74970	Johnson, E. F., Co.	299 10th Ave. S. W.	Waseca, MN 56093
75042	TRW Electronic Components, IRC Philadelphia Div.	401 N. Broad St.	Philadelphia, PA 19108
75378	CTS Knights, Inc.	222 Reimann Ave.	Sandwich, IL 60548
78488	Stackpole Carbon Co.		St. Marys, PA 15857
78526	Stanwyck Winding Div., San Fernando Electric Mfg. Co., Inc.	139 Walsh Ave.	Newburgh, NY 12550
80009	Tektronix, Inc.	P. O. Box 500	Beaverton, OR 97005
84411	TRW, Capacitor Division	112 W. First St.	Ogallala, NB 69153
86684	RCA Corp., Electronic Components	415 S. 5th. St.	Harrison, NJ 07029
90201	Mallory Capacitor Co.	3029 E. Washington St.	Indianapolis, IN 46206
91637	Dale Electronics, Inc.	P. O. Box 609	Columbus, NE 68601
98291	Sealectro Corp.	225 Hoyt	Mamroneck, NY 10544

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-2292-00		CKT BOARD ASSY:--TIMING	80009	670-2292-00
A2	670-2816-00		CKT BOARD ASSY:--MODULATOR	80009	670-2816-00
A3	670-2815-00		CKT BOARD ASSY:--AMPLIFIER	80009	670-2815-00
A4	670-2817-00		CKT BOARD ASSY:--GEN LOCK	80009	670-2817-00
A5	670-1473-04		CKT BOARD ASSY:--POWER SUPPLY	80009	670-1473-04
A6	670-2146-01		CKT BOARD ASSY:--RELAY	80009	670-2146-01
C1015	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C1031	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C1045	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C1061	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C1107	283-0058-00		CAP.,FXD,CER DI:0.27UF,10%,100V	72982	825-220Z5F0273K
C1131	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C1171	283-0594-00		CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D15-1F102F0
C1185	283-0622-00		CAP.,FXD,MICA D:450PF,1%,300V	00853	D15-3F451F0
C1189	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C1191	283-0622-00		CAP.,FXD,MICA D:450PF,1%,300V	00853	D15-3F451F0
C1207	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C1221	285-0835-00		CAP.,FXD,PLSTC:0.22UF,2%,100V	84411	TEK35-22421
C1243	283-0077-00		CAP.,FXD,CER DI:330PF,5%,500V	56289	40C94A3
C1251	283-0615-00		CAP.,FXD,MICA D:33PF,5%,500V	00853	D15-5E330J0
C1361	283-0593-00		CAP.,FXD,MICA D:0.01UF,1%,100V	72136	DM30F103F0100
C1363	283-0593-00		CAP.,FXD,MICA D:0.01UF,1%,100V	72136	DM30F103F0100
C1365	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131-100651104Z
C1461	285-0626-00		CAP.,FXD,PLSTC:0.0015UF,10%,100V	01002	64F10A152
C1471	283-0594-00		CAP.,FXD,PLSTC:0.001UF,1%,100V	00853	D15-1F102F0
C1483	281-0721-00		CAP.,FXD,CER DI:72PF,5%,500V	72982	301000P3K720J
C1593	283-0178-00		CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131-100651104Z
C1601	283-0032-00		CAP.,FXD,CER DI:470PF,5%,500V	72982	831-000Z5D0471J
C1621	283-0032-00		CAP.,FXD,CER DI:470PF,5%,500V	72982	831-000Z5D0471J
C1681	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C1745	290-0512-00		CAP.,FXD,ELCTLT.:22UF,20%,15V	05397	T368B226M015AZ
C1769	283-0239-00		CAP.,FXD,CER DI:0.022UF,10%,50V	72982	8131-050W5R223K
C1863	283-0239-00		CAP.,FXD,CER DI:0.022UF,10%,50V	72982	8131-050W5R223K
C1961	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C1965	290-0529-00		CAP.,FXD,ELCTLT.:47UF,20%,20V	56289	196D476X0020LA3
C1985	283-0638-00		CAP.,FXD,MICA D:130PF,1%,100V	00853	D15-1E131F0
C1989	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C2312	290-0524-00		CAP.,FXD,ELCTLT.:4.7UF,20%,10V	90201	TDC475M010EL
C2356	290-0524-00		CAP.,FXD,ELCTLT.:4.7UF,20%,10V	90201	TDC475M010EL
C2388	290-0524-00		CAP.,FXD,ELCTLT.:4.7UF,20%,10V	90201	TDC475M010EL
C2554	290-0530-00		CAP.,FXD,ELCTLT.:68UF,20%,6V	90201	TDC686M006FL
C2590	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C2600	283-0631-00		CAP.,FXD,MICA D:95PF,1%,100V	00853	D15-1E950F0
C2620	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C2622	283-0651-00		CAP.,FXD,MICA D:430PF,1%,500V	00853	D15-5F431F0
C2624	283-0594-00		CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D15-1F102F0
C2626	283-0631-00		CAP.,FXD,MICA D:95PF,1%,100V	00835	D15-1E950F0
C2644	290-0524-00		CAP.,FXD,ELCTLT.:4.7UF,20%,10V	90201	TDC475M010EL
C2654	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C2656	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C2678	283-0647-00		CAP.,FXD,MICA D:70PF,1%,100V	00853	D15-1E700F0
C2712	283-0111-00		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131-050651104M
C2726	283-0639-00		CAP.,FXD,MICA D:56PF,1%,100V	00853	D15-1E560F0
C2728	283-0687-00		CAP.,FXD,MICA D:560PF,2%,300V	72136	DM15E561G0300
C2730	283-0047-00		CAP.,FXD,CER DI:270PF,5%,500V	72982	861-00Z5D0270J
C2762	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C2764	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C2778	283-0647-00		CAP.,FXD,MICA D:70PF,1%,100V	00853	D15-1E700F0
C2782	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C2840	283-0649-00		CAP.,FXD,MICA D:105PF,1%,300V	00853	D15-3F1050F0
C2904	283-0634-00		CAP.,FXD,MICA D:65PF,1%,100V	00853	D15-1E650F0
C2906	283-0603-00		CAP.,FXD,MICA D:113PF,2%,300V	00853	D15-3F1130G0

# Electrical Parts List-1441

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C2920	283-0634-00		CAP.,FXD,MICA D:65PF,1%,100V	00853	D15-1E650F0
C2922	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C2938	281-0064-00		CAP.,VAR,PLSTC:0.25-1.5PF,TUB.,600V	72982	530-002
C2942	283-0648-00		CAP.,FXD,MICA D:10PF,5%,100V	00853	D15-1C100D0
C2952	283-0648-00		CAP.,FXD,MICA D:10PF,0.5%,100V	00853	D15-1C100D0
C2954	281-0537-00		CAP.,FXD,CER DI:0.68PF,20%,500V	80009	281-0537-00
C2966	283-0004-00		CAP.,FXD,CER DI:0.2UF,150V	56289	55C21A7
C2968	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C12A7
C2980	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C12A7
C2982	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C12A7
C2986	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C12A7
C2988	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C2998	283-0599-00		CAP.,FXD,MICA D:198PF,5%,500V	72136	DM10E980J0500
C3232	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3284	290-0367-00		CAP.,FXD,ELCTLT.:70UF,20%,6V	56289	30D1802
C3414	281-0523-00		CAP.,FXD,CER DI:100PF,20%,350V	72982	301-000U2M0101M
C3454	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3464	281-0592-00		CAP.,FXD,CER DI:4.7PF,+/-0.5PF,500V	72982	301-023C0H0479D
C3474	283-0023-00		CAP.,FXD,CER DI:0.1UF,+80-20%,10V	56289	40C639
C3484	281-0543-00		CAP.,FXD,CER DI:270PF,10%,500V	72982	301-055X5P271K
C3490	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3492	281-0509-00		CAP.,FXD,CER DI:15PF,10%,500V	72982	301-000C0G0150K
C3494	281-0509-00		CAP.,FXD,CER DI:15PF,10%,500V	72982	301-000C0G0150K
C3604	290-0530-00		CAP.,FXD,ELCTLT.:68UF,20%,6V	90201	TDC686M006FL
C3606	290-0527-00		CAP.,FXD,ELCTLT.:15UF,20%,20V	90201	TDC156M020FL
C3614	283-0599-00		CAP.,FXD,MICA D:98PF,5%,500V	72136	DM10E980J0500
C3630	281-0064-00		CAP.,VAR,PLSTC:0.25-1.5PF,TUB.,600V	72982	530-002
C3660	281-0153-00		CAP.,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-055
C3662	281-0645-00		CAP.,FXD,CER DI:8.2PF,+/-0.25PF,500V	72982	374011C0H0829C
C3704	290-0527-00		CAP.,FXD,ELCTLT.:15UF,20%,20V	90201	TDC156M020FL
C3712	290-0415-00		CAP.,FXD,ELCTLT.:5.6UF,10%,35V	56289	150D565X9035B2
C3728	281-0541-00		CAP.,FXD,CER DI:6.8PF,(NOMINAL VALUE)SEL	72982	301-000C0H0689D
C3758	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3786	285-0835-00		CAP.,FXD,PLSTC:0.22UF,2%,100V	84411	TEK35-22421
C3792	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C3802	283-0023-00		CAP.,FXD,CER DI:0.1UF,+80-20%,10V	56289	40C639
C3814	283-0644-00		CAP.,FXD,MICA D:150PF,1%,500V	00853	D15-5F151F0
C3816	283-0644-00		CAP.,FXD,MICA D:150PF,1%,500V	00853	D15-5F151F0
C3842	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3844	281-0523-00		CAP.,FXD,CER DI:100PF,20%,350V	72982	301-000U2M0101M
C3846	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3851	290-0534-00		CAP.,FXD,ELCTLT.:1UF,20%,35V	56289	196D105X0035HA1
C3855	283-0001-00		CAP.,FXD,CER DI:0.005UF,500V	72982	851559Z5U502P
C3862	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C3864	290-0517-00		CAP.,FXD,ELCTLT.:6.8UF,20%,35V	56289	196D685X0035KA1
C3876	290-0527-00		CAP.,FXD,ELCTLT.:15UF,20%,20V	90201	TDC156M020FL
C3884	283-0023-00		CAP.,FXD,CER DI:0.1UF,+80-20%,10V	56289	40C639
C3892	283-0023-00		CAP.,FXD,CER DI:0.1UF,+80-20%,10V	56289	40C639
C4140	281-0543-00		CAP.,FXD,CER DI:270PF,10%,500V	72982	301-055X5P271K
C4148	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C4180	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C4230	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C4235	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C4236	283-0628-00		CAP.,FXD,MICA D:410PF,1%,500V	00853	D15-5F411F0
C4246	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C4252	283-0631-00		CAP.,FXD,MICA D:95PF,1%,100V	00853	D15-1E950F0
C4254	283-0111-00		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131-050651104M
C4264	283-0111-00		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131-050651104M
C4284	283-0631-00		CAP.,FXD,MICA D:95PF,1%,100V	00853	D15-1E950F0
C4346	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C4350	283-0620-00		CAP.,FXD,MICA D:470PF,1%,300V	00853	D15-3F471F0
C4380	283-0620-00		CAP.,FXD,MICA D:470PF,1%,300V	00853	D15-3F471F0
C4384	281-0543-00		CAP.,FXD,CER DI:270PF,10%,500V	72982	301-055X5P271K

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
C4386	281-0543-00		CAP.,FXD,CER DI:270PF,10%,500V	72982	301-055X5P271K
C4420	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C4426	281-0523-00		CAP.,FXD,CER D:100PF,20%,350V	72982	301-000U2M0101M
C4430	283-0111-00		CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8131-050651104M
C4432	281-0523-00		CAP.,FXD,CER DI:100PF,20%,350V	72982	301-000U2M0101M
C4446	281-0523-00		CAP.,FXE,CER D:100PF,20%,350V	72982	301-000U2M0101M
C4452	283-0660-00		CAP.,FXD,MICA D:510PF,2%,500V	72136	DM15F511G0500
C4470	283-0660-00		CAP.,FXD,MICA D:510PF,2%,500V	72136	DM15F511G0500
C4484	283-0651-00		CAP.,FXD,MICA D:430PF,1%,500V	00853	D15-5F431F0
C4492	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C4520	290-0517-00		CAP.,FXD,ELCTLT.:6.8UF,20%,35V	56289	196D685X0035KA1
C4522	290-0517-00		CAP.,FXD,ELCTLT.:6.8UF,20%,35V	56289	196D685X0035KA1
C4524	290-0517-00		CAP.,FXD,ELCTLT.:6.8UF,20%,35V	56289	196D685X0035KA1
C4536	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C4546	283-0003-00		CAP.,FXD,CER DI:0.01UF,+80-20%,150V	56289	20C205A1
C4548	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C4564	283-0144-00		CAP.,FXD,CER DI:33PF,1%,500V	72982	801547P2G330F
C4574	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C4576	283-0028-00		CAP.,FXD,CER DI:0.022UF,50V	56289	55C144
C4578	283-0620-00		CAP.,FXD,MICA D:470PF,1%,300V	00853	D15-3F471F0
C4586	281-0503-00		CAP.,FXD,CER DI:8PF,+/-0.5PF,500V	72982	301-000C0H0809D
C4590	283-0004-00		CAP.,FXD,CER DI:0.02UF,150V	56289	55C21A7
C9010	283-0177-00		CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039651105Z
C9011	290-0334-00		CAP.,FXD,ELCTLT.:1250UF,+75-10%,50V	56289	D46468
C9042	290-0443-00		CAP.,FXD,ELCTLT.:3000UF,20V	56289	601D308F020JL2
C9061	290-0334-00		CAP.,FXD,ELCTLT.:1250UF,+75-10%,50V	56289	D46468
C9802	285-0598-00		CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	64F10AC103
C9810	283-0026-00		CAP.,FXD,CER DI:0.2UF,+80-20%,25V	56289	274C3
C9824	290-0296-00		CAP.,FXD,ELCTLT.:100UF,20%,20V	56289	150D107X0020S2
C9830	285-0598-00		CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	64F10AC103
C9831	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C9832	290-0135-00		CAP.,FXD,ELCTLT.:15UF,20%,20V	56289	150D156X0020B2
C9840	283-0026-00		CAP.,FXD,CER DI:0.2UF,+80-20%,25V	56289	274C3
C9850	290-0135-00		CAP.,FXD,ELCTLT.:15UF,20%,20V	56289	150D156X0020B2
C9852	283-0026-00		CAP.,FXD,CER DI:0.2UF,+80-20%,25V	56289	274C3
C9854	283-0000-00		CAP.,FXD,CER DI:0.001UF,+100-0%,500V	56289	40C626
C9856	285-0598-00		CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	64F10AC103
C9941	281-0123-00		CAP.,VAR,CER DI:5-25PF,100V	72982	518-000A5-25
C9961	283-0622-00		CAP.,FXD,MICA D:450PF,1%,300V	00853	D15-3F451F0
C9965	283-0643-00		CAP.,FXD,MICA D:22PF,+/-0.5PF,300V	72136	DM10C220D0300
C9991	281-0123-00		CAP.,VAR,CER DI:5-25PF,100V	72982	518-000A5-25
CR1017	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1181	152-0270-00		SEMICON D DEVICE:SILICON,VARICAP,4V,56PF	01281	V791
CR1209	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1311	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1315	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1345	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1441	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1451	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1563	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1565	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1591	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1781	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1783	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR1785	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2512	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2514	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2522	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2524	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2542	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2544	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2560	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220
CR2584	152-0141-02		SEMICON D DEVICE:SILICON,30V,50NA	07910	CD8220

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Qty No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
CR2642	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2650	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2700	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2702	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2710	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2974	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2976	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR2994	152-0269-00		SEMICON D DEVICE: SILICON, VARICAP, 4V, 33PF	73445	1N3182
CR3608	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR3762	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR3794	152-0269-00		SEMICON D DEVICE: SILICON, VARICAP, 4V, 33PF	73445	1N3182
CR3822	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR3878	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR3886	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR3888	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4126	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4162	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4228	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4234	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4324	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4336	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4532	152-0141-02		SEMICON D DEVICE: SILICON, 30V, 50NA	07910	CD8220
CR4568	152-0269-00		SEMICON D DEVICE: SILICON, VARICAP, 4V, 33PF	73445	1N3182
CR9802	152-0198-00		SEMICON D DEVICE: SILICON, 200V, 3A	04713	1N4721
CR9804	152-0198-00		SEMICON D DEVICE: SILICON, 200V, 3A	04713	1N4721
CR9830	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9832	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9834	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9836	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9870	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9872	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9874	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
CR9876	152-0066-00		SEMICON D DEVICE: SILICON, 400V, 1A	02735	1N3194
DS9201	150-0048-00		LAMP, INCANDESC: 5V, 60MA	08806	683
DS9210	150-0035-00		LAMP, GLOW: 0.3MA	08806	A1D-T
DS9230	150-0048-00		LAMP, INCANDESC: 5V, 60MA	08806	683
DS9240	150-0048-00		LAMP, INCANDESC: 5V, 60MA	08806	683
DS9250	150-0048-00		LAMP, INCANDESC: 5V, 60MA	08806	683
DS9260	150-0048-00		LAMP, INCANDESC: 5V, 60MA	08806	683
F9201	159-0030-00		FUSE, CARTRIDGE: 0.3A, 3AG, FAST-BLO	71400	AGC3-10
FL9201	119-0389-00		FIL, RAD. INTFER: 115/230 VAC, 3A	80009	119-0389-00
J9010	131-0148-00		CONN, RECP, ELECT.: 24 CONTACTS	02660	26-190-24-1004
J9014	131-0324-00		CONN, RECP, ELECT.: 24 PIN	29587	57-402240
J9220	131-0779-00		JACK, TIP:	98291	SKT-0804
J9225	131-0779-00		JACK, TIP:	98291	SKT-0804
J9943	131-1097-00		CONN, RECP, ELECT.: BNC, FEMALE	24931	28JR220-1
J9983	131-1097-00		CONN, RECP, ELECT.: BNC, FEMALE	24931	28JR220-1
K9967	148-0034-00		RELAY, ARMATURE: SENS, DPDT, 15V DC	71482	A-100279
L1151	108-0174-00		COIL, FXD: 245UH	80009	108-0174-00
L1287	108-0443-00		COIL, FXD: 25UH	80009	108-0443-00
L1367	114-0308-00		COIL, VAR: 2.9-6.5UH, CORE 276-0506-00	80009	114-0308-00
L1983	108-0317-00		COIL, FXD: 15UH	78526	71501M
L2604	114-0278-00		COIL, VAR: 4.6-16.7UH, CORE 276-0568-00	80009	114-0278-00
L2628	114-0278-00		COIL, VAR: 4.6-16.7UH, CORE 276-0568-00	80009	114-0278-00
L2676	108-0443-00		COIL, FXD: 25UH	80009	108-0443-00
L2776	108-0443-00		COIL, FXD: 25UH	80009	108-0443-00
L2810	114-0177-00		COIL, VAR: 280-650UH, CORE NOT REPLACEABLE	32436	387-650
L2820	114-0177-00		COIL, VAR: 280-650UH, CORE NOT REPLACEABLE	32436	387-650
L2902	108-0443-00		COIL, FXD: 25UH	80009	108-0443-00
L2908	108-0443-00		COIL, FXD: 25UH	80009	108-0443-00

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L2958	108-0226-00		COIL,FXD:100UH	80009	108-0226-00
L3285	276-0507-00		SHIELDING BEAD:0.6UH INDUCTANCE	78488	57-0180-70
L3418	108-0226-00		COIL,FXD:100UH	80009	108-0226-00
L3784	108-0226-00		COIL,FXD:100UH	80009	108-0226-00
L4057	114-0222-00		COIL,VAR:2-6UH,CORE 276-0568-00	80009	114-0222-00
L4288	108-0317-00		COIL,FXD:15UH	78526	71501M
L4360	108-0458-00		COIL,FXD:72NH	80009	108-0458-00
L4382	108-0458-00		COIL,FXD:72NH	80009	108-0458-00
L4480	108-0070-00		COIL,FXD:4.6UH	80009	108-0070-00
L9963	108-0755-00		COIL,FXD:2.9UH	80009	108-0755-00
P9010	131-0149-00		CONN,RECEP,ELECT.:24 CONTACT,MALE	02660	26-159-24
P9014	131-0325-00		CONN,PLUG,ELECT.:24 PIN CABLE END,MALE	71785	57-30240 398
Q1021	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1023	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1063	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1065	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1121	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1163	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q1165	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1223	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1225	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1255	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1263	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1353	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1453	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1455	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1463	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q1465	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q1653	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1655	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1663	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1671	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1685	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1687	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S024848
Q1761	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q1771	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q1773	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S024848
Q1775	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1789	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1791	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q1871	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q1967	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q2500	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q2520	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q2540	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q2570	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q2580	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q2582	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q2660	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q2670	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q2690	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q2720	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q2760	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q2770	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q2980	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q3240	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q3250	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3280	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3360	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3420	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3450	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3460	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
Q3470	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q3610	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q3640	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q3650	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q3670	151-0104-00		TRANSISTOR:SILICON,NPN	07263	SP08481
Q3722	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3740	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q3750	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q3760	151-1039-00		TRANSISTOR:SILICON,JFE,P CHANNEL	04713	2N5462
Q3810	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q3820	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q3840	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q3860	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q3870	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q3880	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q4001	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q4003	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S024848
Q4005	151-1005-00		TRANSISTOR:SILICON,JFE,N CHANNEL	07910	U1490
Q4009	151-1005-00		TRANSISTOR:SILICON,JFE,N CHANNEL	07910	U1490
Q4011	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q4012	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q4013	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S024848
Q4015	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q4016	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q4017	151-0220-00		TRANSISTOR:SILICON,PNP	07263	S036228
Q4018	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q4019	151-0223-00		TRANSISTOR:SILICON,NPN	07263	S024848
Q4031	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q4032	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q4042	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q4043	151-0192-00		TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	80009	151-0192-00
Q4052	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q4062	151-1005-00		TRANSISTOR:SILICON,JFE,N CHANNEL	07910	U1490
Q4064	151-1005-00		TRANSISTOR:SILICON,JFE,N CHANNEL	07910	U1490
Q4067	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q4068	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q4069	151-0410-00		TRANSISTOR:SILICON,PNP	04713	SPS6765
Q4077	151-0198-00		TRANSISTOR:SILICON,NPN	04713	SPS8802-1
Q9035	151-0349-00		TRANSISTOR:SILICON,NPN	04713	SJE924
Q9055	151-0349-00		TRANSISTOR:SILICON,NPN	04713	SJE924
Q9085	151-0349-00		TRANSISTOR:SILICON,NPN	04713	SJE924
Q9800	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q9802	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q9804	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q9806	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q9830	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q9832	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q9834	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q9836	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q9850	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q9852	151-0188-00		TRANSISTOR:SILICON,PNP	04713	2N3906
Q9854	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q9856	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q9903	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
R1001	311-1228-00		RES.,VAR, NONWIR:10K OHM	73138	72PM-11-0-103K
R1011	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1013	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R1041	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R1043	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R1071	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R1081	321-0270-00		RES.,FXD,FILM:6.34K OHM,1%,0.125W	75042	CEATO-6341F
R1083	321-0255-00		RES.,FXD,FILM:4.42K OHM,1%,0.125W	75042	CEATO-4421F
R1085	315-0432-00		RES.,FXD,COMP:4.3K OHM,5%,0.25W	01121	CB4325



Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1101	315-0513-00		RES.,FXD,COMP:51K OHM,5%,0.25W	01121	CB5135
R1103	321-0270-00		RES.,FXD,FILM:6.43K OHM,1%,0.125W	75042	CEAT0-6341F
R1105	321-0255-00		RES.,FXD,FILM:4.42K OHM,1%,0.125W	75042	CEAT0-4421F
R1107	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R1141	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1143	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R1145	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R1181	315-0113-00		RES.,FXD,COMP:11K OHM,5%,0.25W	00121	CB1135
R1183	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R1187	315-0623-00		RES.,FXD,COMP:62K OHM,5%,0.25W	01121	CB6235
R1193	315-0623-00		RES.,FXD,COMP:62K OHM,5%,0.25W	01121	CB6235
R1201	315-0185-00		RES.,FXD,COMP:1.8M OHM,5%,0.25W	01121	CB1855
R1203	315-0275-00		RES.,FXD,COMP:2.7M OHM,5%,0.25W	01121	CB2755
R1205	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1211	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1241	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R1245	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R1247	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1249	315-0122-00		RES.,FXD,COMP:1.2K OHM,5%,0.25W	01121	CB1225
R1283	315-0474-00		RES.,FXD,COMP:470K OHM,5%,0.25W	01121	CB4745
R1285	315-0475-00		RES.,FXD,COMP:4.7M OHM,5%,0.25W	01121	CB4755
R1313	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1317	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1319	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1341	315-0622-00		RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R1343	315-0154-00		RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R1347	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R1349	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R1351	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1369	315-0333-00		RES.,FXD,COMP:33K OHM,5%,0.25W	01121	CB3335
R1443	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R1445	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R1447	321-0312-00		RES.,FXD,FILM:174.K OHM,1%,0.125W	75042	CEAT0-1742F
R1449	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R1457	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R1473	315-0821-00		RES.,FXD,COMP:820 OHM,5%,0.25W	01121	CB8215
R1475	315-0181-00		RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R1481	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R1485	315-0223-00		RES.,FXD,COMP:22K OHM,5%,0.25W	01121	CB2235
R1487	315-0240-00		RES.,FXD,COMP:24 OHM,5%,0.25W	01121	CB2405
R1531	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R1533	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R1561	315-0623-00		RES.,FXD,COMP:62K OHM,5%,0.25W	01121	CB6235
R1567	315-0113-00		RES.,FXD,COMP:11K OHM,5%,0.25W	01121	CB1135
R1581	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R1583	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R1623	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1651	315-0274-00		RES.,FXD,COMP:270K OHM,5%,0.25W	01121	CB2745
R1661	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R1665	315-0561-00		RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R1667	315-0361-00		RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R1669	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R1683	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R1741	315-0914-00		RES.,FXD,COMP:910K OHM,5%,0.25W	01121	CB9145
R1743	315-0274-00		RES.,FXD,COMP:270K OHM,5%,0.25W	01121	CB2745
R1763	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R1765	315-0393-00		RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R1767	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R1787	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R1861	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1865	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R1867	315-0301-00		RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R1869	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R1873	315-0241-00		RES.,FXD,COMP:240 OHM,5%,0.25W	01121	CB2415
R1890	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R1963	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R1981	315-0391-00		RES.,FXD,COMP:390 OHM,5%,0.25W	01121	CB3915
R1987	315-0430-00		RES.,FXD,COMP:43 OHM,5%,0.25W	01121	CB4305
R2371	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R2380	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R2382	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2392	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2491	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2510	311-1228-00		RES.,VAR,NONWIR:10K OHM,20%,0.5W	73138	72PM-11-0-103K
R2516	321-0325-00		RES.,FXD,FILM:23.7K OHM,1%,0.125W	75042	CEATO-2372F
R2526	311-1226-00		RES.,VAR,NONWIR:2.5K OHM,20%,0.5W	73138	72PM-09-0-0252K
R2528	321-0247-00		RES.,FXD,FILM:3.65K OHM,1%,0.125W	75042	CEATO-3651F
R2546	311-1227-00		RES.,VAR,NONWIR:5K OHM,20%,0.5W	73138	72PM-10-0-502K
R2548	321-0280-00		RES.,FXD,FILM:8.06K OHM,1%,0.25W	75042	CEATO-8061F
R2552	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2556	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R2571	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2572	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R2574	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R2585	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2586	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R2588	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2602	321-0115-00		RES.,FXD,FILM:154 OHM,1%,0.125W	75042	CEATO-1540F
R2640	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R2641	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R2646	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R2652	315-0622-00		RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R2662	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R2664	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R2672	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R2674	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R2680	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R2681	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2692	315-0361-00		RES.,FXD,COMP:360 OHM,5%,0.25W	01121	CB3615
R2714	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R2722	311-1228-00		RES.,VAR,NONWIR:10K OHM,20%,0.5W	73138	72PM-11-0-103K
R2724	321-0322-00		RES.,FXD,FILM:22.1K OHM,1%,0.125W	75042	CEATO-2212F
R2742	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEATO-1001F
R2744	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01124	CB1015
R2746	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.25W	75042	CEATO-2001F
R2766	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R2772	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R2774	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2780	311-1223-00		RES.,VAR,NONWIR:250 OHM,10%,0.5W	73138	72PM-05-0-251K
R2842	321-0812-07		RES.,FXD,FILM:455 OHM,0.1%,0.125W	75042	CEAT9-4550B
R2844	321-0812-07		RES.,FXD,FILM:455 OHM,0.1%,0.125W	75042	CEAT9-4550B
R2846	315-0511-00		RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R2848	315-0511-00		RES.,FXD,COMP:510 OHM,5%,0.25W	01121	CB5115
R2850	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R2852	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEATO-1001F
R2900	321-0164-00		RES.,FXD,COMP:499 OHM,1%,0.125W	75042	CEATO-4990F
R2910	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEATO-1001F
R2924	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEATO-4990F
R2926	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R2950	311-1231-00		RES.,VAR,NONWIR:25K OHM,20%,0.5W	73138	72PM-13-0-253K
R2956	315-0181-00		RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R2960	315-0181-00		RES.,FXD,COMP:180 OHM,5%,0.25W	01121	CB1815
R2962	315-0302-00		RES.,FXD,COMP:3K OHM,5%,0.25W	01121	CB3025
R2964	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R2972	315-0242-00		RES.,FXD,COMP:2.4K OHM,5%,0.25W	01121	CB2425
R2978	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525

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R2984	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R2990	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R2992	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R2996	321-0184-00		RES.,FXD,FILM:806 OHM,1%,0.125W	75042	CEAT0-8060F
R2999	321-0172-00		RES.,FXD,COMP:604 OHM,1%,0.125W	75042	CEAT0-6040F
R3230	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R3234	321-0241-00		RES.,FXD,FILM:3.16K OHM,1%,0.125W	75042	CEAT0-3161F
R3242	321-0152-00		RES.,FXD,FILM:374 OHM,1%,0.125W	75042	CEAT0-3740F
R3252	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3254	321-0296-00		RES.,FXD,FILM:11.8K OHM,1%,0.125W	75042	CEAT0-1182F
R3256	315-0221-00		RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R3262	315-0333-00		RES.,FXD,COMP:33K OHM,5%,0.25W	01121	CB3335
R3264	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R3282	311-1224-00		RES.,VAR,NONWIR:500 OHM,20%,0.5W	73138	72PM-06-0-501K
R3286	321-0085-00		RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEAT0-75R00F
R3288	321-0178-00		RES.,FXD,FILM:698 OHM,1%,0.125W	75042	CEAT0-6980F
R3410	315-0680-00		RES.,FXD,COMP:68 OHM,5%,0.25W	01121	CB6805
R3411	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R3412	321-0085-00		RES.,FXD,FILM:75 OHM,1%,0.125W	75042	CEAT0-75R00F
R3416	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3422	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3423	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R3424	321-0171-00		RES.,FXD,FILM:590 OHM,1%,0.125W	75042	CEAT0-5900F
R3426	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3428	321-0164-00		RES.,FXD,FILM:499 OHM,0.25%,0.125W	75042	CEAT0-4990F
R3430	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R3440	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R3442	321-0171-00		RES.,FXD,FILM:590 OHM,1%,0.125W	75042	CEAT0-5900F
R3444	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3446	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R3456	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R3462	321-0193-00		RES.,FXD,FILM:1K OHM,1%,0.125W	75042	CEAT0-1001F
R3470	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R3472	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3476	315-0221-00		RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R3482	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R3488	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R3489	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R3610	301-0821-00		RES.,FXD,COMP:820 OHM,5%,0.25W	01121	EB8215
R3620	311-1224-00		RES.,VAR,NONWIR:500 OHM,20%,0.5W	73138	72PM-06-0-501K
R3622	321-0164-03		RES.,FXD,FILM:499 OHM,0.25%,0.125W	75042	CEAT0-4990F
R3624	315-0123-00		RES.,FXD,COMP:12K OHM,5%,0.25W	01121	CB1235
R3626	321-0131-00		RES.,FXD,FILM:226 OHM,1%,0.125W	75042	CEAT0-2260F
R3632	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R3652	315-0393-00		RES.,FXD,COMP:39K OHM,5%,0.25W	01121	CB3935
R3664	321-0164-03		RES.,FXD,FILM:499 OHM,0.25%,0.125W	75042	CEAT0-4990F
R3666	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R3668	321-0164-03		RES.,FXD,FILM:499 OHM,0.25%,0.125W	75042	CEAT2-4990F
R3672	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R3674	321-0131-00		RES.,FXD,COMP:226 OHM,1%,0.125W	75042	CEAT0-2260F
R3676	315-0681-00		RES.,FXD,COMP:680 OHM,5%,0.25W	01121	CB6815
R3678	315-0106-00		RES.,FXD,COMP:10M OHM,5%,0.25W	01121	CB1065
R3684	315-0823-00		RES.,FXD,COMP:82K OHM,5%,0.25W	01121	CB8235
R3686	315-0823-00		RES.,FXD,COMP:12K OHM,5%,0.25W	01121	CB8235
R3688	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R3702	307-0103-00		RES.,FXD,COMP:2.7 OHM,5%,0.25W	01121	CB27G5
R3706	315-0362-00		RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625
R3714	315-0151-00		RES.,FXD,COMP:150 OHM,5%,0.25W	01121	CB1515
R3718	311-1234-00		RES.,VAR,NONWIR:50K OHM,20%,0.5W	73138	72PM-92-0-503K
R3720	311-1234-00		RES.,VAR,NONWIR:50K OHM,20%,0.5W	73138	72PM-92-0-503K
R3724	315-0333-00		RES.,FXD,COMP:33K OHM,5%,0.25W	01121	CB3335
R3726	321-0239-00		RES.,FXD,FILM:3.01K OHM,1%,0.125W	75042	CEAT0-3011F
R3732	321-0210-00		RES.,FXD,FILM:1.5K OHM,1%,0.125W	75042	CEAT0-1501F

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R3734	301-0122-00		RES.,FXD,COMP:1.2K OHM,5%,0.5W	01121	EB1225
R3736	315-0431-00		RES.,FXD,COMP:430 OHM,5%,0.25W	01121	CB4315
R3742	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R3744	321-0239-00		RES.,FXD,FILM:3.01K OHM,1%,0.125W	75042	CEAT0-3011F
R3746	321-0126-00		RES.,FXD,COMP:200 OHM,1%,0.125W	75042	CEAT0-2000F
R3748	321-0126-00		RES.,FXD,FILM:200 OHM,1%,0.125W	75042	CEAT0-2000F
R3752	321-0238-00		RES.,FXD,FILM:2.94K OHM,1%,0.125W	75042	CEAT0-2941F
R3754	321-0165-00		RES.,FXD,FILM:511 OHM,1%,0.125W	75042	CEAT0-5110F
R3756	321-0258-00		RES.,FXD,FILM:4.75K OHM,1%,0.125W	75042	CEAT0-4751F
R3766	315-0474-00		RES.,FXD,COMP:470K OHM,5%,0.25W	01121	CB4745
R3768	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R3782	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R3788	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R3790	315-0223-00		RES.,FXD,COMP:22K OHM,5%,0.25W	01121	CB2235
R3796	315-0823-00		RES.,FXD,COMP:82K OHM,5%,0.25W	01121	CB8235
R3810	315-0221-00		RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R3812	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R3818	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R3824	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R3832	315-0332-00		RES.,FXD,COMP:3.3K OHM,5%,0.25W	01121	CB3325
R3834	315-0563-00		RES.,FXD,COMP:56K OHM,5%,0.25W	01121	CB5635
R3836	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R3838	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R3850	311-1231-00		RES.,VAR,NONWIR:25K OHM,20%,0.5W	73138	72PM-13-0-253K
R3852	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R3854	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R3856	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R3684	315-0123-00		RES.,FXD,COMP:12K OHM,5%,0.25W	01121	CB1235
R3866	315-0273-00		RES.,FXD,COMP:27K OHM,5%,0.25W	01121	CB2735
R3868	315-0272-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2725
R3872	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R3874	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R3882	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R3890	315-0224-00		RES.,FXD,COMP:220K OHM,5%,0.25W	01121	CB2245
R3894	315-0224-00		RES.,FXD,COMP:220K OHM,5%,0.25W	01121	CB2245
R4011	311-1231-00		RES.,VAR,NONWIR:25K OHM,20%,0.5W	73138	72PM-13-0-253K
R4084	311-1231-00		RES.,VAR,NONWIR:25K OHM,20%,0.5W	73138	72PM-13-0-253K
R4120	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4122	315-0223-00		RES.,FXD,COMP:22K OHM,5%,0.25W	01121	CB2235
R4124	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4128	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R4142	315-0623-00		RES.,FXD,COMP:62K OHM,5%,0.25W	01121	CB6235
R4144	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R4146	315-0396-00		RES.,FXD,COMP:39M OHM,5%,0.25W	01121	CB3965
R4150	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4152	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4160	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4164	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4182	315-0396-00		RES.,FXD,COMP:39M OHM,5%,0.25W	01121	CB3965
R4184	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R4186	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4188	315-0470-00		RES.,FXD,COMP:47 OHM,5%,0.25W	01121	CB4705
R4220	315-0223-00		RES.,FXD,COMP:22K OHM,5%,0.25W	01121	CB2235
R4222	315-0303-00		RES.,FXD,COMP:30K OHM,5%,0.25W	01121	CB3035
R4224	315-0223-00		RES.,FXD,COMP:22K OHM,5%,0.25W	01121	CB2235
R4226	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4232	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4238	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R4240	315-0563-00		RES.,FXD,COMP:56K OHM,5%,0.25W	01121	CB5635
R4242	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4244	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R4248	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEAT0-4990F
R4250	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535

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R4262	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R4266	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R4280	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4282	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEAT0-4990F
R4286	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R4320	315-0221-00		RES.,FXD,COMP:220 OHM,5%,0.25W	01121	CB2215
R4322	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4326	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4328	315-0822-00		RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R4330	315-0202-00		RES.,FXD,COMP:2K OHM,5%,0.25W	01121	CB2025
R4332	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R4340	315-0822-00		RES.,FXD,COMP:8.2K OHM,5%,0.25W	01121	CB8225
R4342	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R4344	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4348	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEAT0-4990F
R4362	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4364	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R4366	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R4368	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R4370	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4372	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4374	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R4376	321-0164-00		RES.,FXD,FILM:499 OHM,1%,0.125W	75042	CEAT0-4990F
R4386	315-0271-00		RES.,FXD,COMP:270 OHM,5%,0.25W	01121	CB2715
R4422	315-0432-00		RES.,FXD,COMP:4.3K OHM,5%,0.25W	01121	CB4325
R4424	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R4428	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4440	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4442	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R4444	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R4448	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R4450	315-0910-00		RES.,FXD,COMP:91 OHM,5%,0.25W	01121	CB9105
R4472	315-0220-00		RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R4482	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R4486	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R4488	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R4490	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R4494	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R4496	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R4497	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R4498	315-0222-00		RES.,FXD,COMP:2.2K OHM,5%,0.25W	01121	CB2225
R4499	315-0100-00		RES.,FXD,COMP:10 OHM,5%,0.25W	01121	CB1005
R4526	315-0333-00		RES.,FXD,COMP:33K OHM,5%,0.25W	01121	CB3335
R4528	315-0474-00		RES.,FXD,COMP:470K OHM,5%,0.25W	01121	CB4745
R4530	315-0275-00		RES.,FXD,COMP:2.7K OHM,5%,0.25W	01121	CB2755
R4534	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R4538	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R4540	315-0475-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4755
R4542	315-0102-00		RES.,FXD,COMP:1K OHM,5%,0.25W	01121	CB1025
R4544	315-0333-00		RES.,FXD,COMP:33K OHM,5%,0.25W	01121	CB3335
R4550	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R4552	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R4560	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R4562	315-0823-00		RES.,FXD,COMP:82K OHM,5%,0.25W	01121	CB8235
R4566	315-0154-00		RES.,FXD,COMP:150K OHM,5%,0.25W	01121	CB1545
R4570	315-0104-00		RES.,FXD,COMP:100K OHM,5%,0.25W	01121	CB1045
R4572	315-0103-00		RES.,FXD,COMP:10K OHM,5%,0.25W	01121	CB1035
R4580	315-0820-00		RES.,FXD,COMP:82 OHM,5%,0.25W	01121	CB8205
R4582	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R4584	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R4588	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R9210	316-0224-00		RES.,FXD,COMP:220K OHM,10%,0.25W	01121	CB2241
R9800	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015

# Electrical Parts List—1441

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R9801	311-1268-00		RES.,VAR, NONWIR:10K OHM,10%,0.5W	73138	62PT-3510-103K
R9802	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9803	301-0101-00		RES.,FXD,COMP:100 OHM,5%,0.5W	01121	EB1015
R9804	308-0245-00		RES.,FXD,WW:0.6 OHM,5%,2W	91637	RS2B162ER6000J
R9806	315-0431-00		RES.,FXD,COMP:430 OHM,5%,0.25W	01121	CB4315
R9808	321-0197-00		RES.,FXD,FILM:1.1K OHM,1%,0.125W	75042	CEAT0-1101F
R9810	321-0189-00		RES.,FXD,FILM:909 OHM,1%,0.125W	75042	CEAT0-9090F
R9812	315-0752-00		RES.,FXD,COMP:7.5K OHM,5%,0.25W	01121	CB7525
R9814	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9816	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R9818	315-0751-00		RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R9830	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9831	311-1268-00		RES.,FXD,COMP:10K OHM,10%,0.5W	73138	62PT-3510-103K
R9832	308-0459-00		RES.,FXD,WW:1.1 OHM,5%,3W	91637	RS2BD1R100J
R9834	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9836	315-0431-00		RES.,FXD,COMP:430 OHM,5%,0.25W	01121	CB4315
R9838	321-0224-00		RES.,FXD,FILM:2.1K OHM,1%,0.125W	75042	CEAT0-2101F
R9840	321-0189-00		RES.,FXD,FILM:909 OHM,1%,0.125W	75042	CEAT0-9090F
R9842	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R9844	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R9846	315-0301-00		RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R9848	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R9850	315-0152-00		RES.,FXD,COMP:1.5K OHM,5%,0.25W	01121	CB1525
R9851	311-1268-00		RES.,FXD,COMP:10K OHM,10%,0.5W	73138	62PT-3510-103K
R9852	315-0431-00		RES.,FXD,COMP:430 OHM,5%,0.25W	01121	CB4315
R9854	321-0172-00		RES.,FXD,FILM:604 OHM,1%,0.125W	75042	CEAT0-6040F
R9856	321-0189-00		RES.,FXD,FILM:909 OHM,1%,0.125W	75042	CEAT0-9090F
R9858	321-0173-00		RES.,FXD,FILM:619 OHM,1%,0.125W	75042	CEAT0-6190F
R9860	315-0471-00		RES.,FXD,COMP:470 OHM,5%,0.25W	01121	CB4715
R9862	315-0301-00		RES.,FXD,COMP:300 OHM,5%,0.25W	01121	CB3015
R9864	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R9866	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9868	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9870	315-0331-00		RES.,FXD,COMP:330 OHM,5%,0.25W	01121	CB3315
R9872	315-0682-00		RES.,FXD,COMP:6.8K OHM,5%,0.25W	01121	CB6825
R9874	308-0459-00		RES.,FXD,WW:1.1 OHM,5%,3W	91637	RS2BD1R00J
R9901	315-0101-00		RES.,FXD,COMP:100 OHM,5%,0.25W	01121	CB1015
R9905	315-0153-00		RES.,FXD,COMP:15K OHM,5%,0.25W	01121	CB1535
R9931	301-0102-00		RES.,FXD,COMP:1K OHM,5%,0.5W	01121	EB1025
S9201	260-0834-00		SWITCH,TOGGLE:	09353	7201-SN
T2930	120-0524-00		XFMR,TOROID:12 TURNS QUADFILAR	80009	120-0524-00
T9001	120-0820-00		XFMR,PWR:	80009	120-0820-00
U1501	156-0034-00		INTEGRATED CKT:DUAL 4-INPUT NAND GATE	01295	SN7420N
U1535	156-0030-00		INTEGRATED CKT:QUAD 2-INPUT NAND GATE	01295	SN7400N
U1601	156-0078-00		INTEGRATED CKT:1-OF-16 DECODER DEMULTIPL	01295	SN74154N
U1631	156-0032-00		INTEGRATED CKT:4-BIT BINARY COUNTER	01295	SN7493N
U1721	156-0041-00		INTEGRATED CKT:DUAL D FLIP-FLOP	27014	DM7474P
U1801	156-0041-00		INTEGRATED CKT:DUAL D FLIP-FLOP	27014	DM7474P
U1831	156-0041-00		INTEGRATED CKT:DUAL D FLIP-FLOP	27014	DM7474P
U2310	156-0030-00		INTEGRATED CKT:QUAD 2-INPUT NAND GATE	01295	SN7400N
U2320	156-0034-00		INTEGRATED CKT:DUAL 4-INPUT NAND GATE	01295	SN7420N
U2340	156-0129-00		INTEGRATED CKT:QUAD 2-INPUT AND GATE	01295	SN7408N
U2350	156-0047-00		INTEGRATED CKT:TRIPLE 3-INPUT NAND GATE	01295	SN7410N
U2370	156-0047-00		INTEGRATED CKT:TRIPLE 3-INPUT NAND GATE	01295	SN7410N
U2390	156-0030-00		INTEGRATED CKT:QUAD 2-INPUT NAND GATE	01295	SN7400N
U2410	156-0030-00		INTEGRATED CKT:QUAD 2-INPUT NAND GATE	01295	SN7400N
U2420	156-0030-00		INTEGRATED CKT:QUAD 2-INPUT NAND GATE	01295	SN7400N
U2440	156-0034-00		INTEGRATED CKT:DUAL 4-INPUT NAND GATE	01295	SN7420N
U2450	156-0047-00		INTEGRATED CKT:TRIPLE 3-INPUT NAND GATE	01295	SN7410N
U2470	156-0030-00		INTEGRATED CKT:QUAD 2-INPUT NAND GATE	01295	SN7400N
U2490	156-0092-00		INTEGRATED CKT:HEX INVERTER	01295	SN7405N

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
U2550	156-0043-00		INTEGRATED CKT:QUAD 2-INPUT NOR GATE	01295	SN7402N
U2950	156-0130-00		INTEGRATED CKT:BAL MODULATOR/DEMODULATOR	04713	MC1496G
U3646	155-0022-00		INTEGRATED CKT:MONOLITHIC,CHANNEL SWITCH	80009	155-0022-00
U4017	156-0158-00		INTEGRATED CKT:DUAL OPERATIONAL AMPL	18324	S5558V
U4031	156-0356-00		INTEGRATED CKT:OPERATIONAL AMPL	86684	CA3080
U4036	156-0130-00		INTEGRATED CKT:BAL MODULATOR/DEMODULATOR	04713	MC1496G
U4038	156-0130-00		INTEGRATED CKT:BAL MODULATOR/DEMODULATOR	04713	MC1496G
U4074	156-0158-00		INTEGRATED CKT:DUAL OPERATIONAL AMPL	18324	S5558V
VR4260	152-0280-00		SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR4268	152-0280-00		SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR4364	152-0280-00		SEMICONV DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A
VR9850	152-0212-00		SEMICONV DEVICE:ZENER,0.5W,9V,5%	80009	152-0212-00
Y4067	158-0069-00		XTAL UNIT,QTZ:3.579545 MHZ	75378	TX005B

[illegible]



# SECTION 5

## DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

### Symbols and Reference Designators

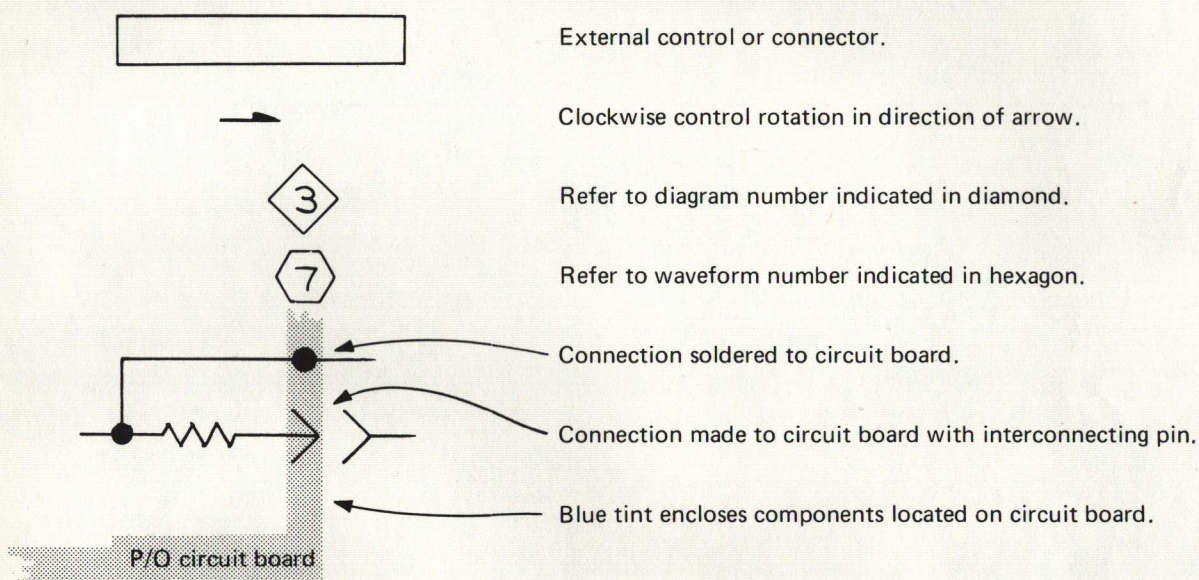
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).  
Values less than one are in microfarads ( $\mu$ F).  
Resistors = Ohms ( $\Omega$ )

Symbols used on the diagrams are based on USA Standard Y32.2-1967.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:

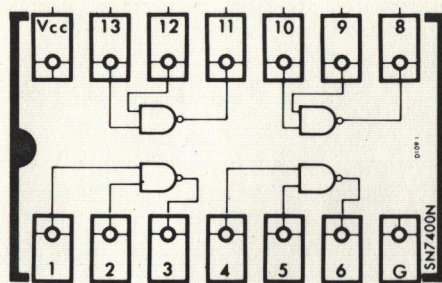


The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

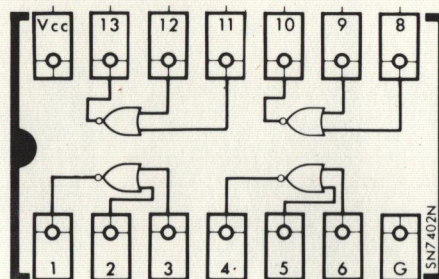
A	Assembly, separable or repairable (circuit board, etc.)	LR	Inductor/resistor combination
AT	Attenuator, fixed or variable	M	Meter
B	Motor	Q	Transistor or silicon-controlled rectifier
BT	Battery	P	Connector, movable portion
C	Capacitor, fixed or variable	R	Resistor, fixed or variable
CR	Diode, signal or rectifier	RT	Thermistor
DL	Delay line	S	Switch
DS	Indicating device (lamp)	T	Transformer
F	Fuse	TP	Test point
FL	Filter	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
H	Heat dissipating device (heat sink, heat radiator, etc.)	V	Electron tube
HR	Heater	VR	Voltage regulator (zener diode, etc.)
J	Connector, stationary portion	Y	Crystal
K	Relay		
L	Inductor, fixed or variable		



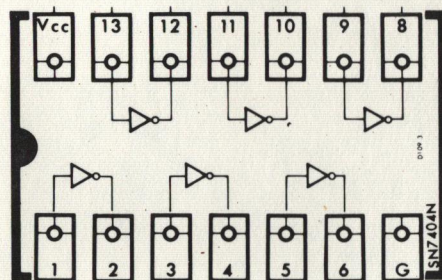
1441



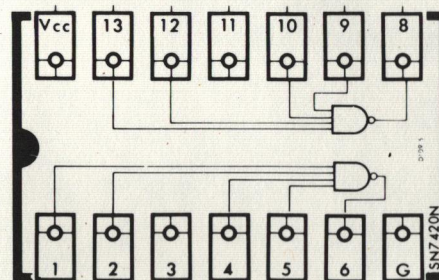
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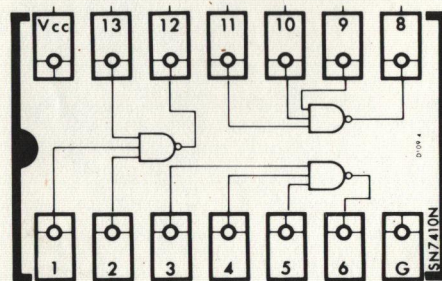
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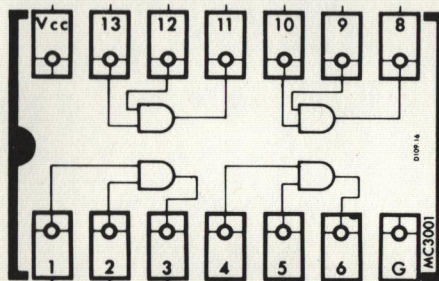
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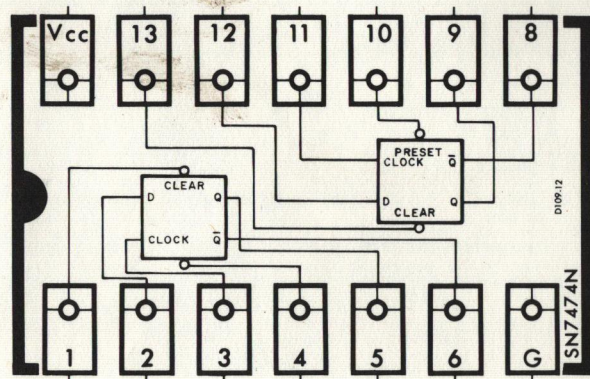
7420



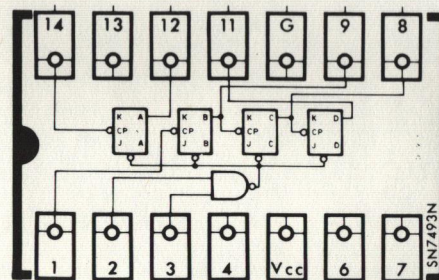
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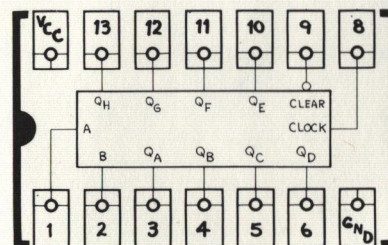
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7474



7493

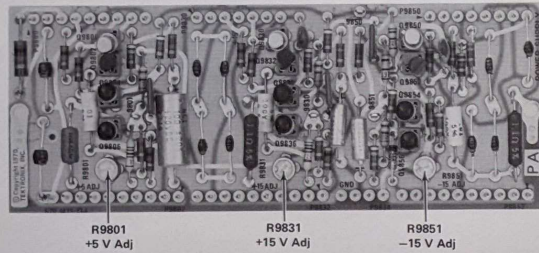


74164

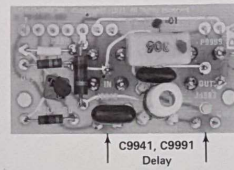
Logic diagrams are intended as an aid to understanding of the schematic diagrams in this section. However, logic symbols on the schematic diagrams have been drawn to indicate function rather than a direct representation of the circuits in the devices.



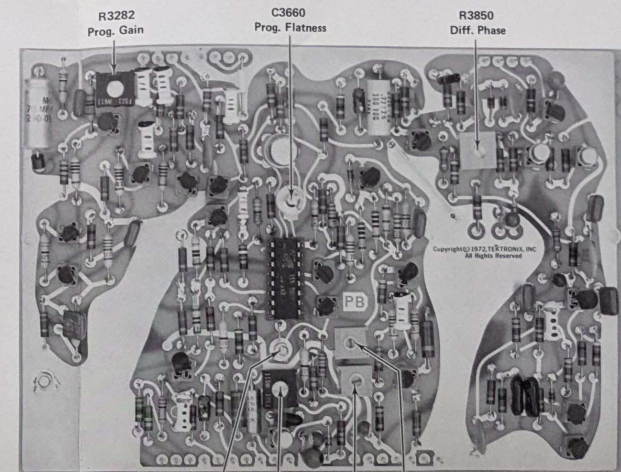
## Power Supply board



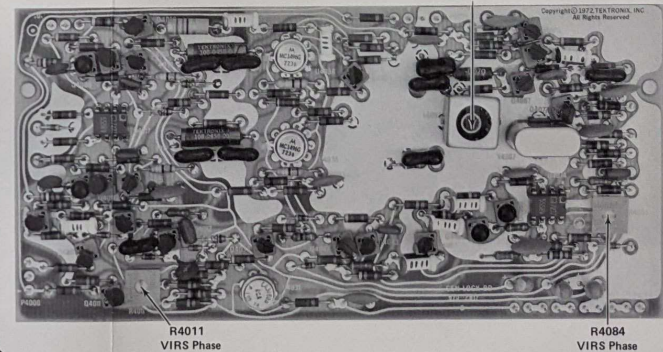
## Relay board



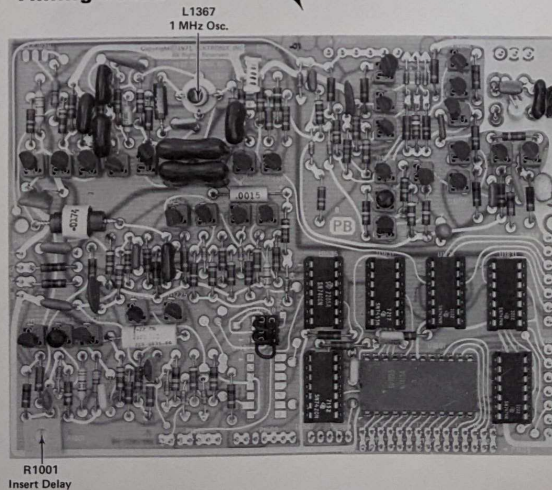
## Amplifier board



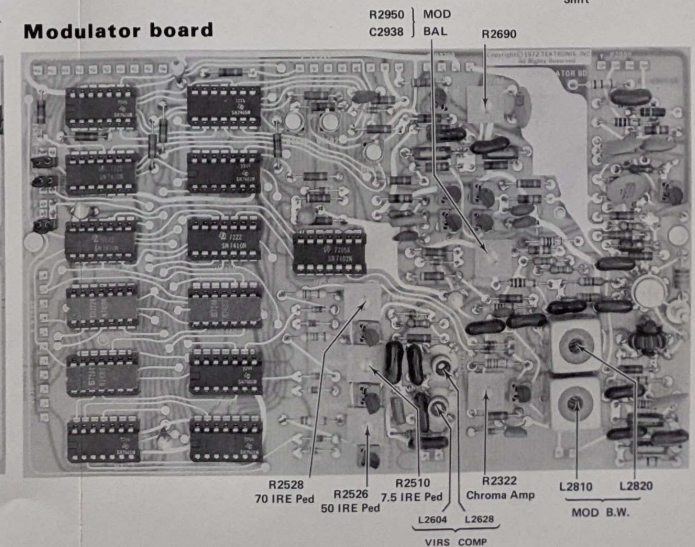
## Gen lock board



## Timing board



## Modulator board



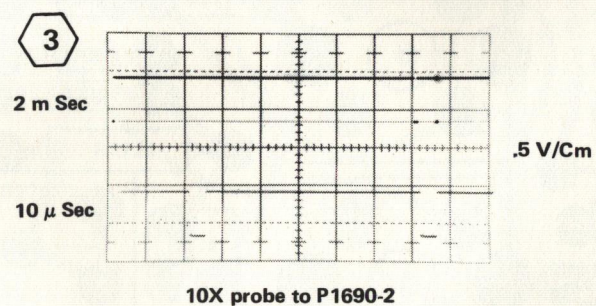
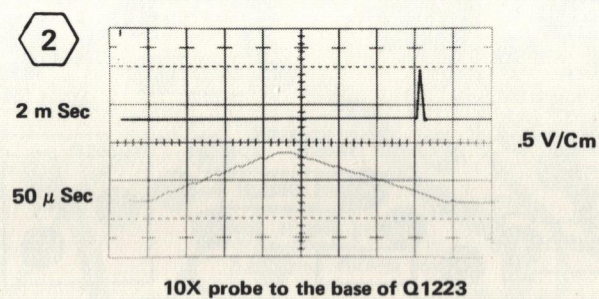
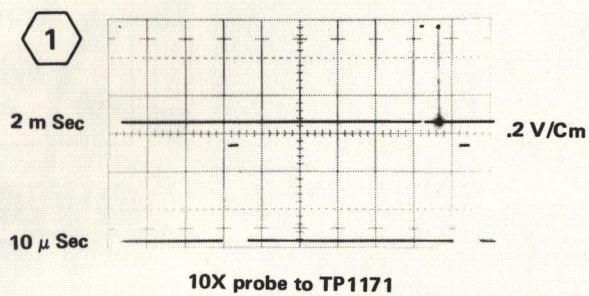






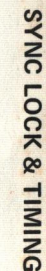




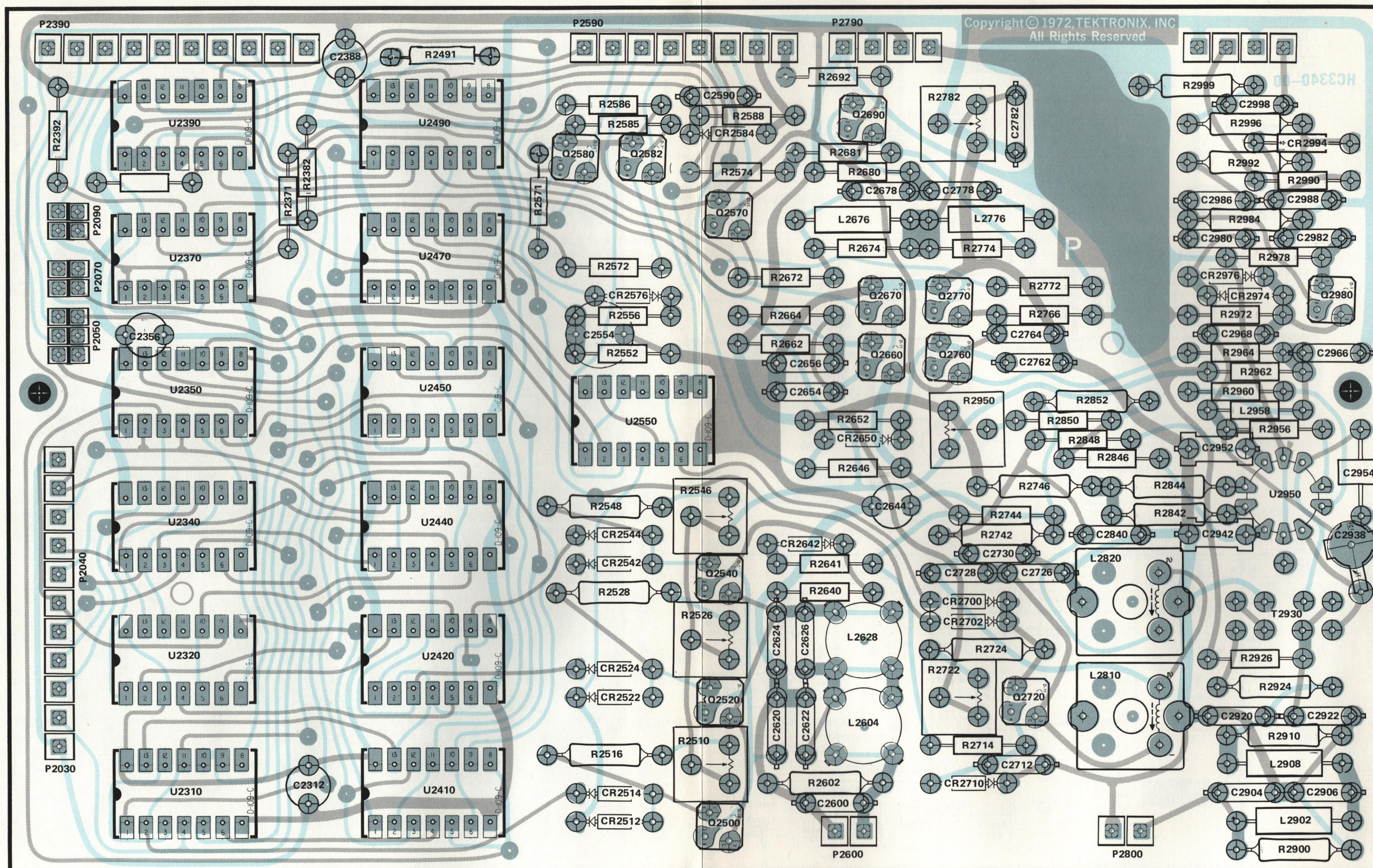




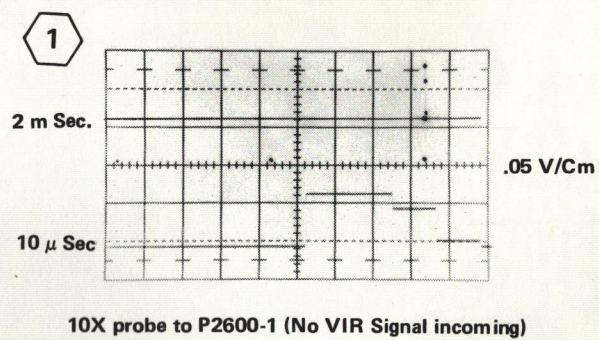
## WAVEFORMS



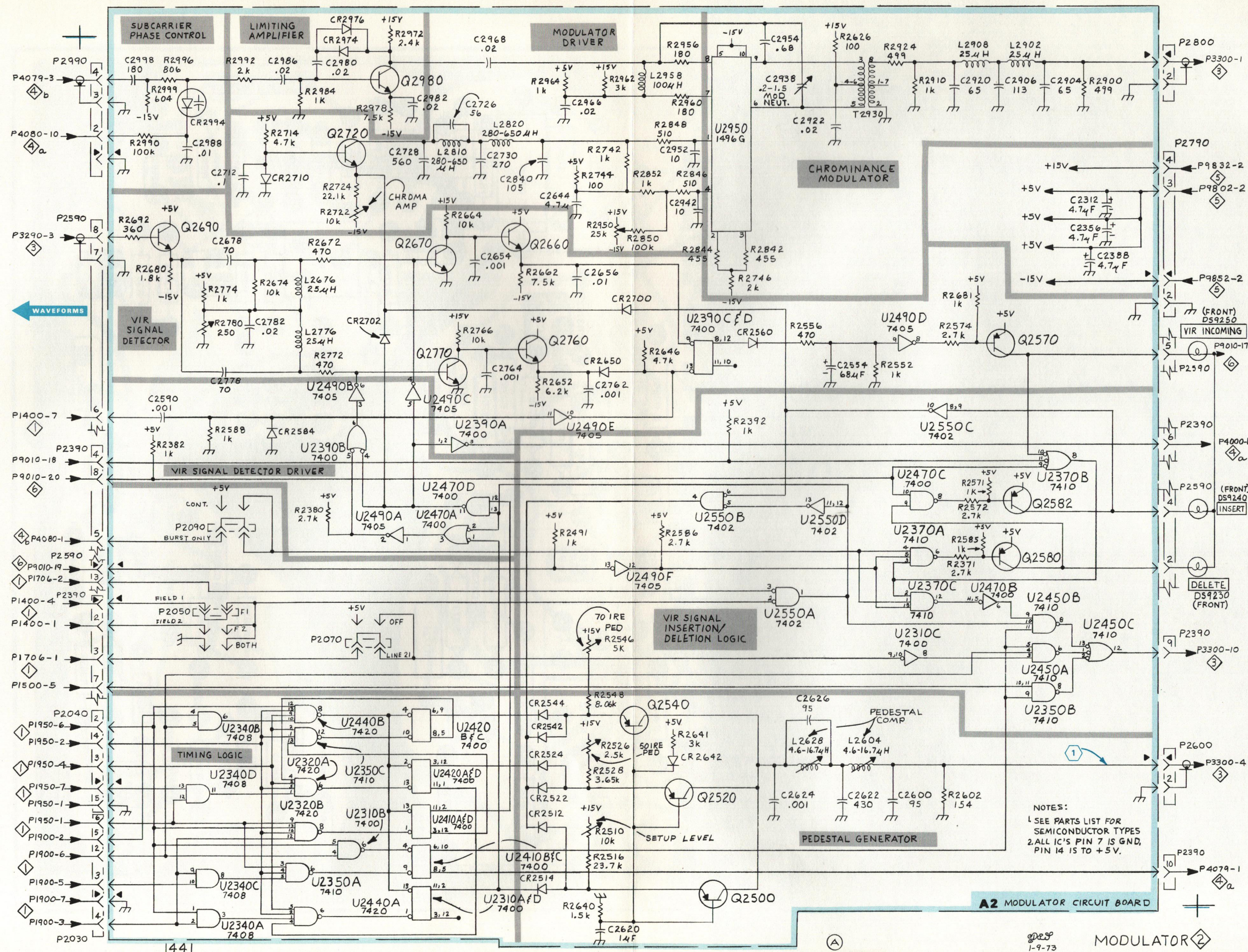




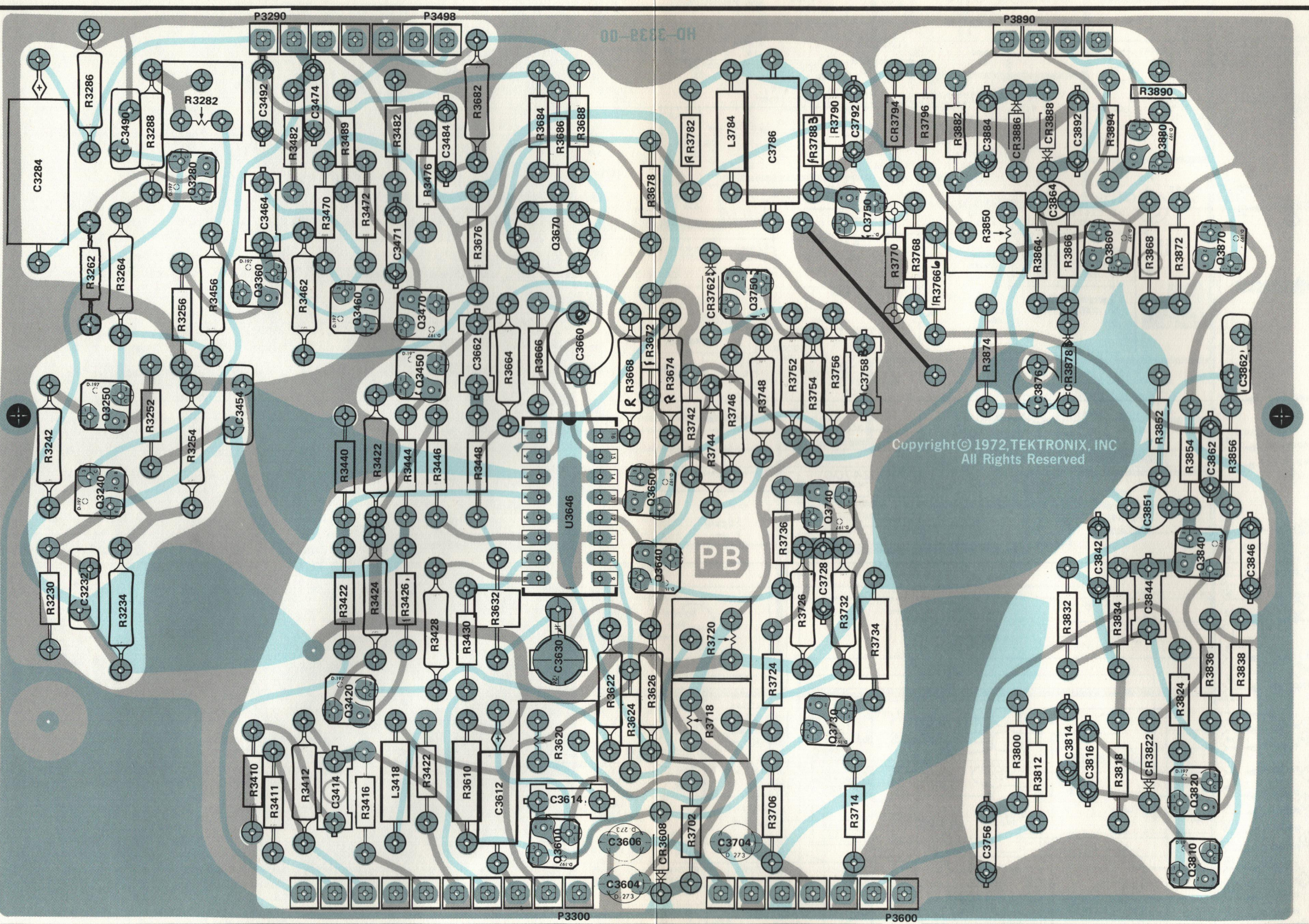






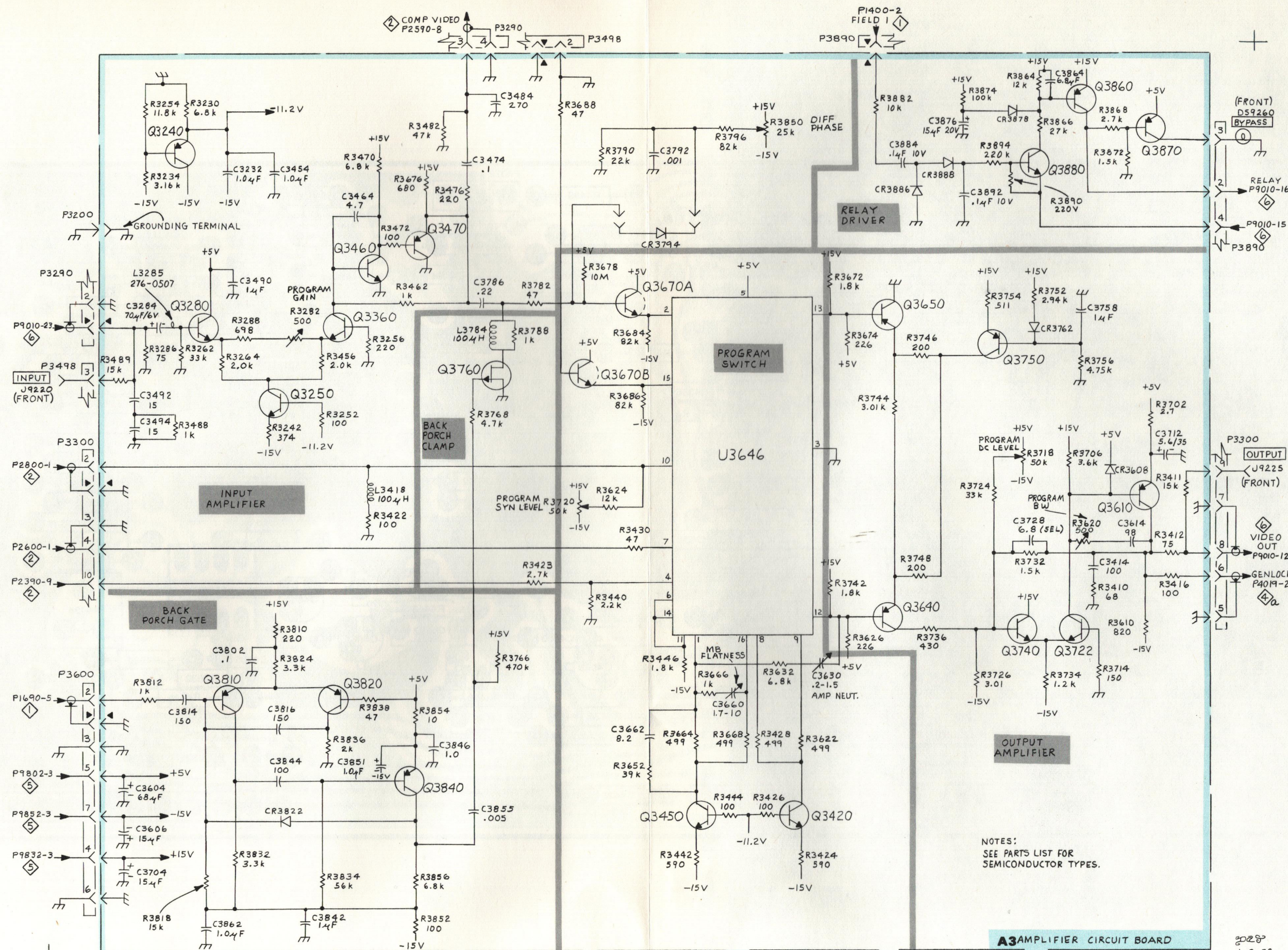






AMPLIFIER BOARD COMPONENT LOCATIONS





NOTES:  
SEE PARTS LIST FOR  
SEMICONDUCTOR TYPES.

A3 AMPLIFIER CIRCUIT BOARD

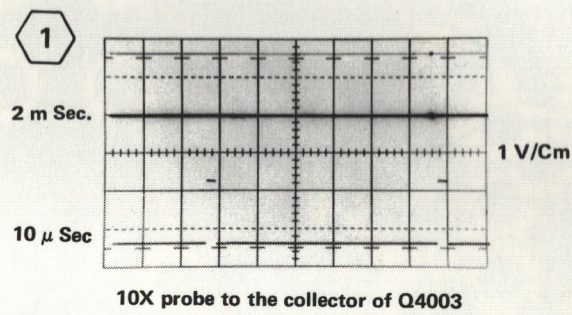
2028  
1-3-73



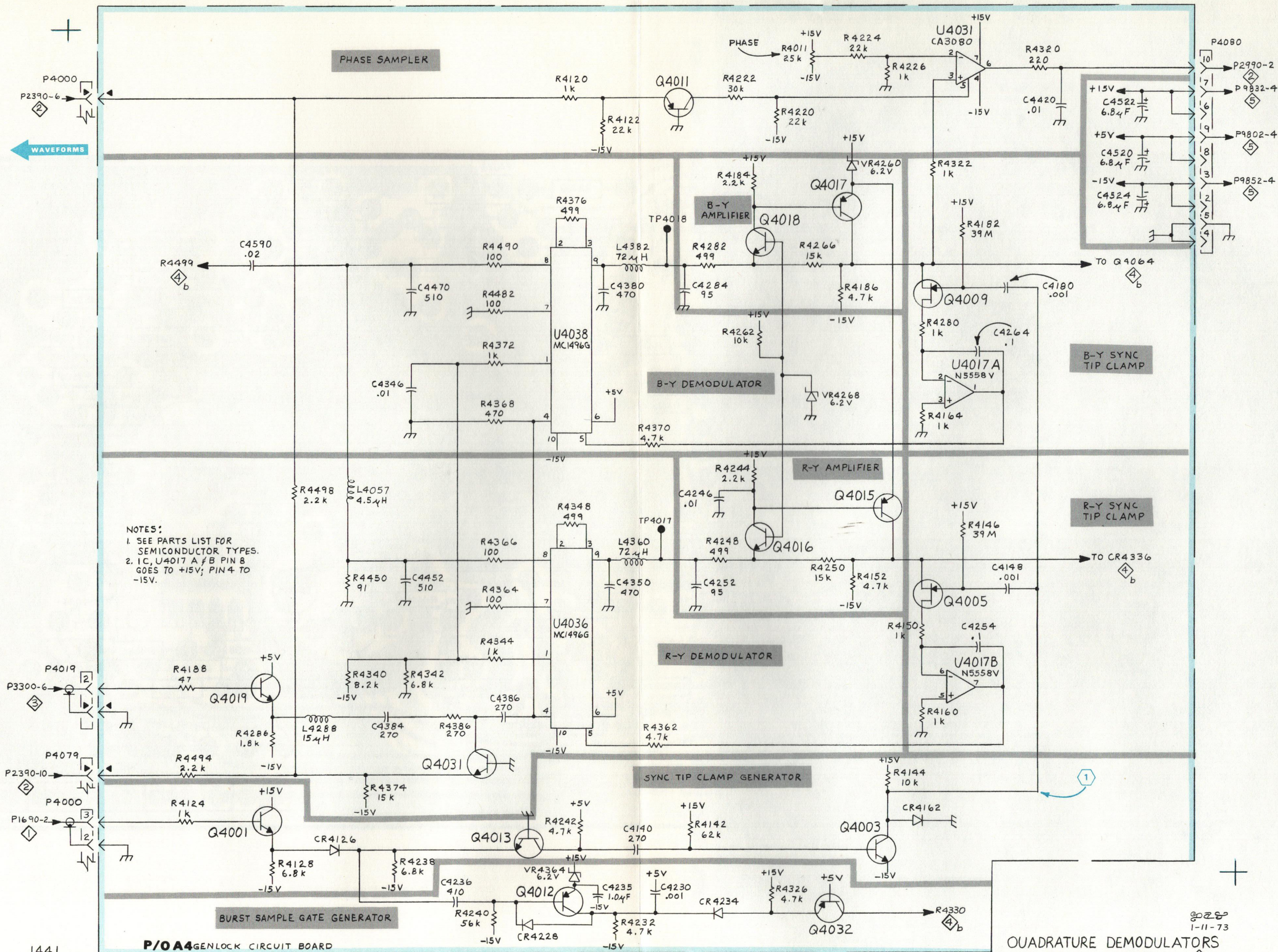


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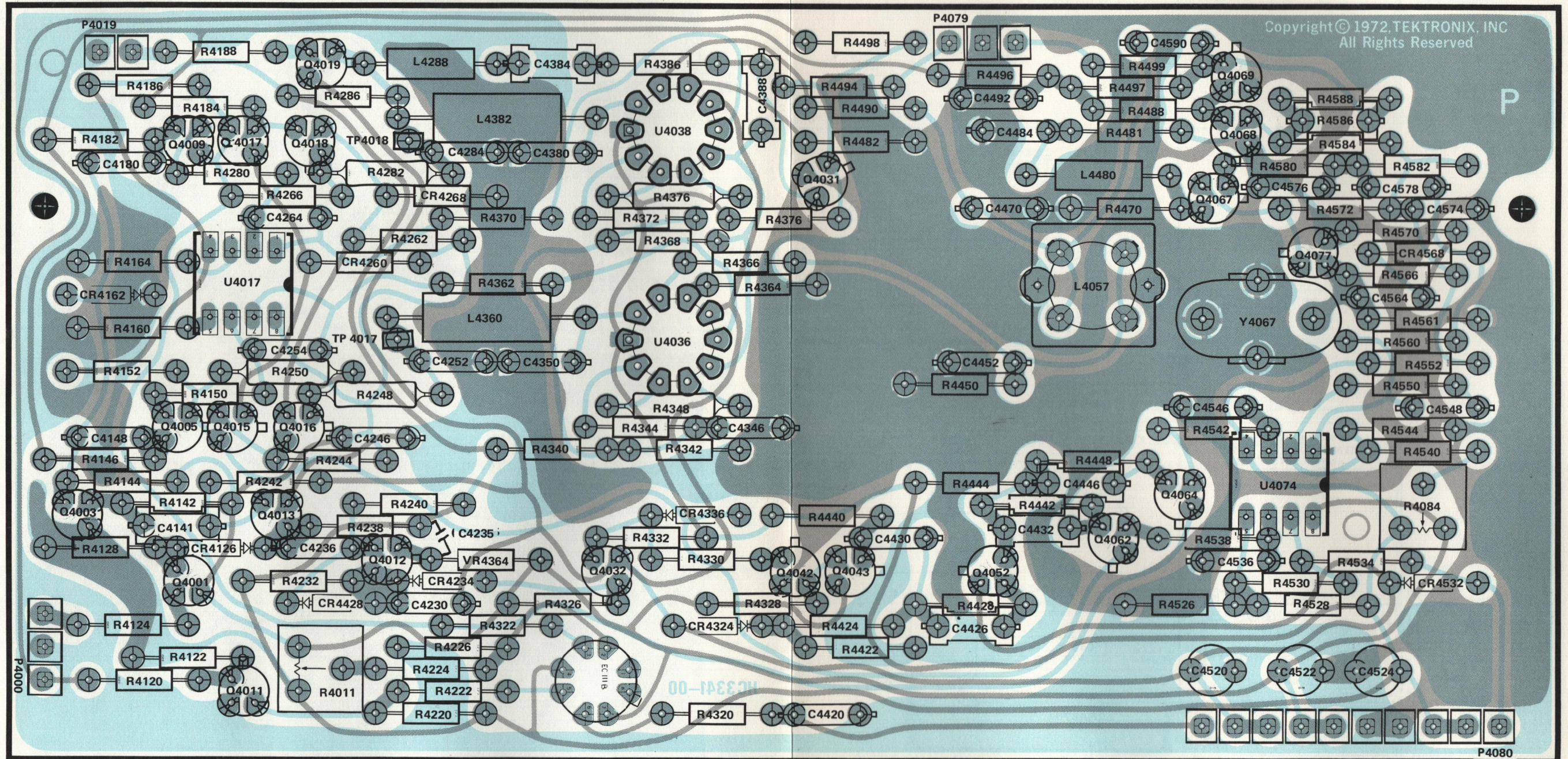




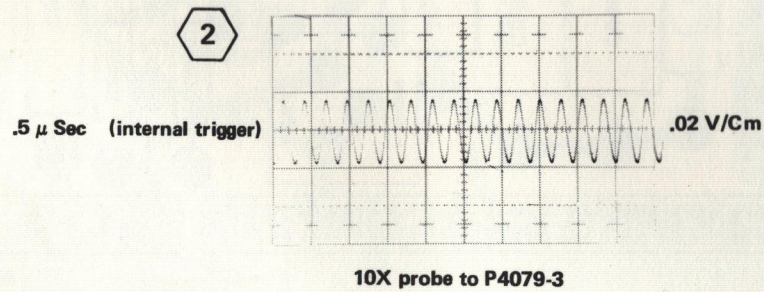
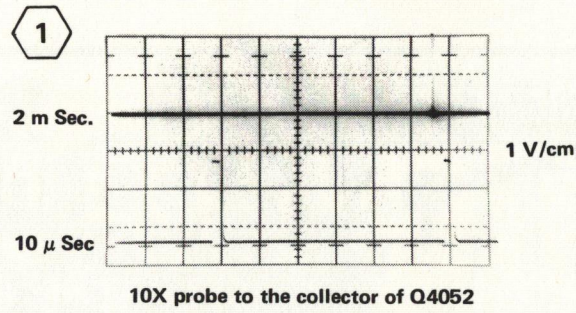






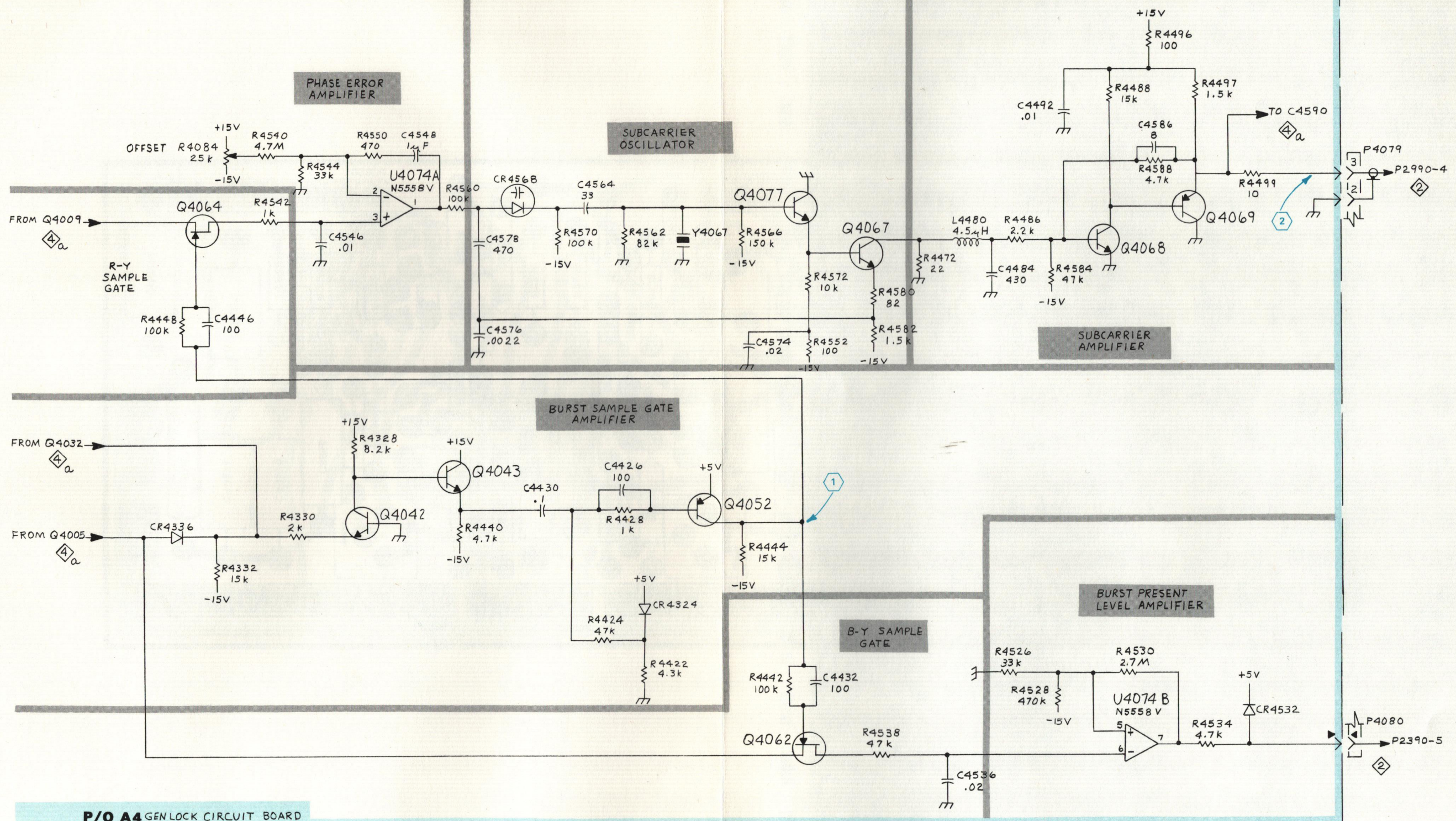








NOTES:  
SEE PARTS LIST FOR  
SEMICONDUCTOR TYPES  
IC, U4074 PIN B GOES TO +15V  
PIN 4 GOES TO -15V



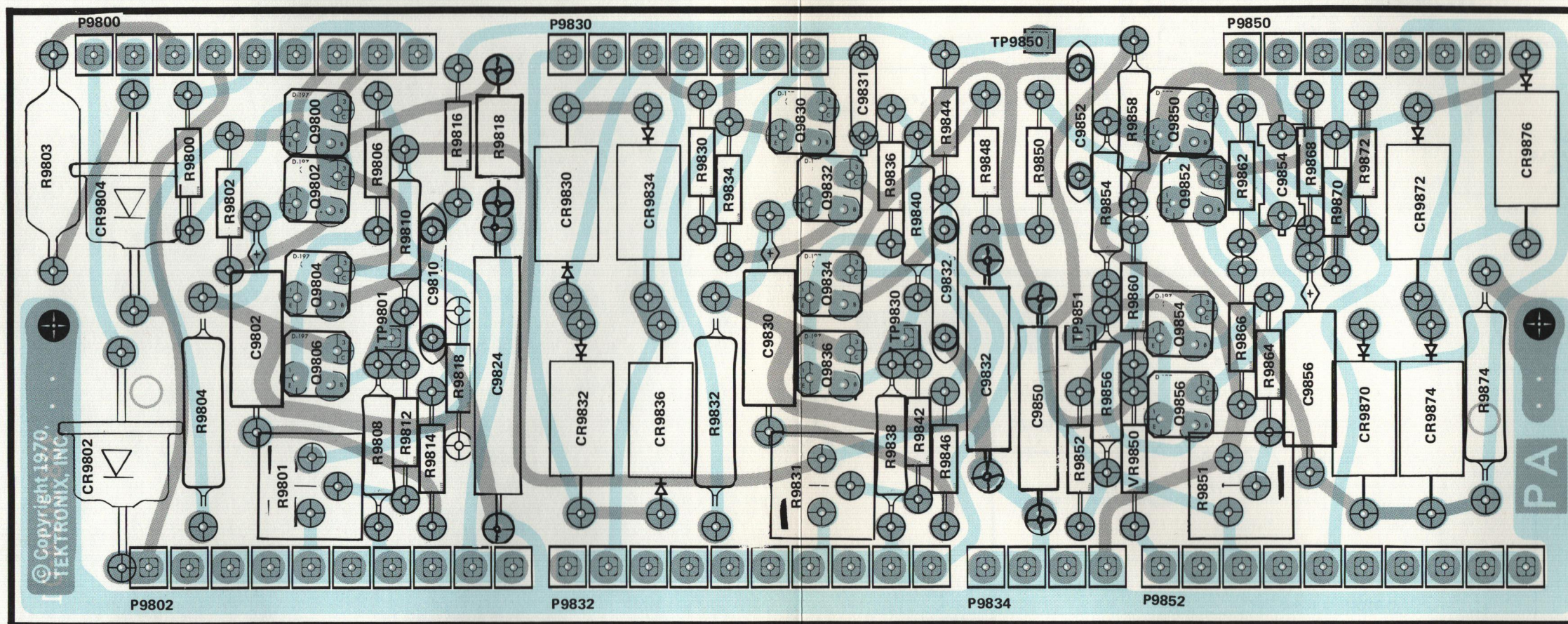
P/O A4 GENLOCK CIRCUIT BOARD

SUBCARRIER OSCILLATOR 4b

1-11-73

SUBCARRIER OSCILLATOR 4b

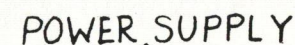




POWER SUPPLY BOARD COMPONENT LOCATIONS

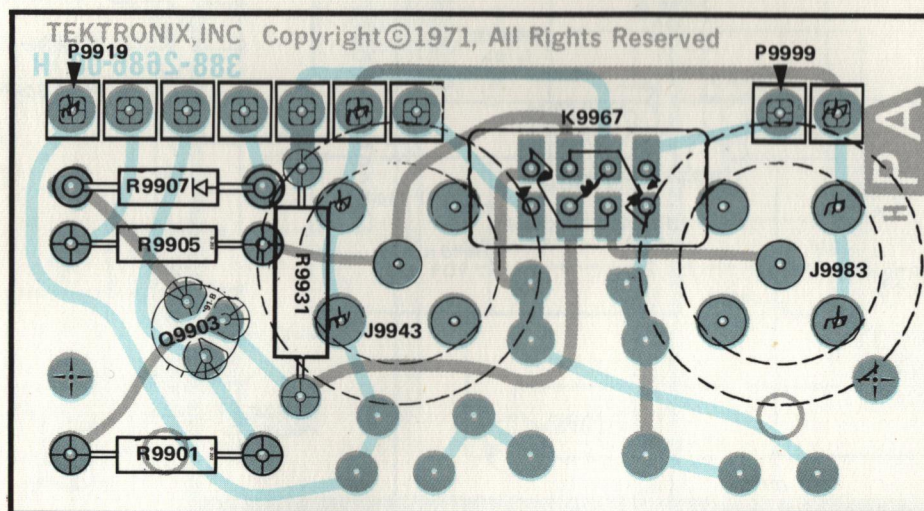
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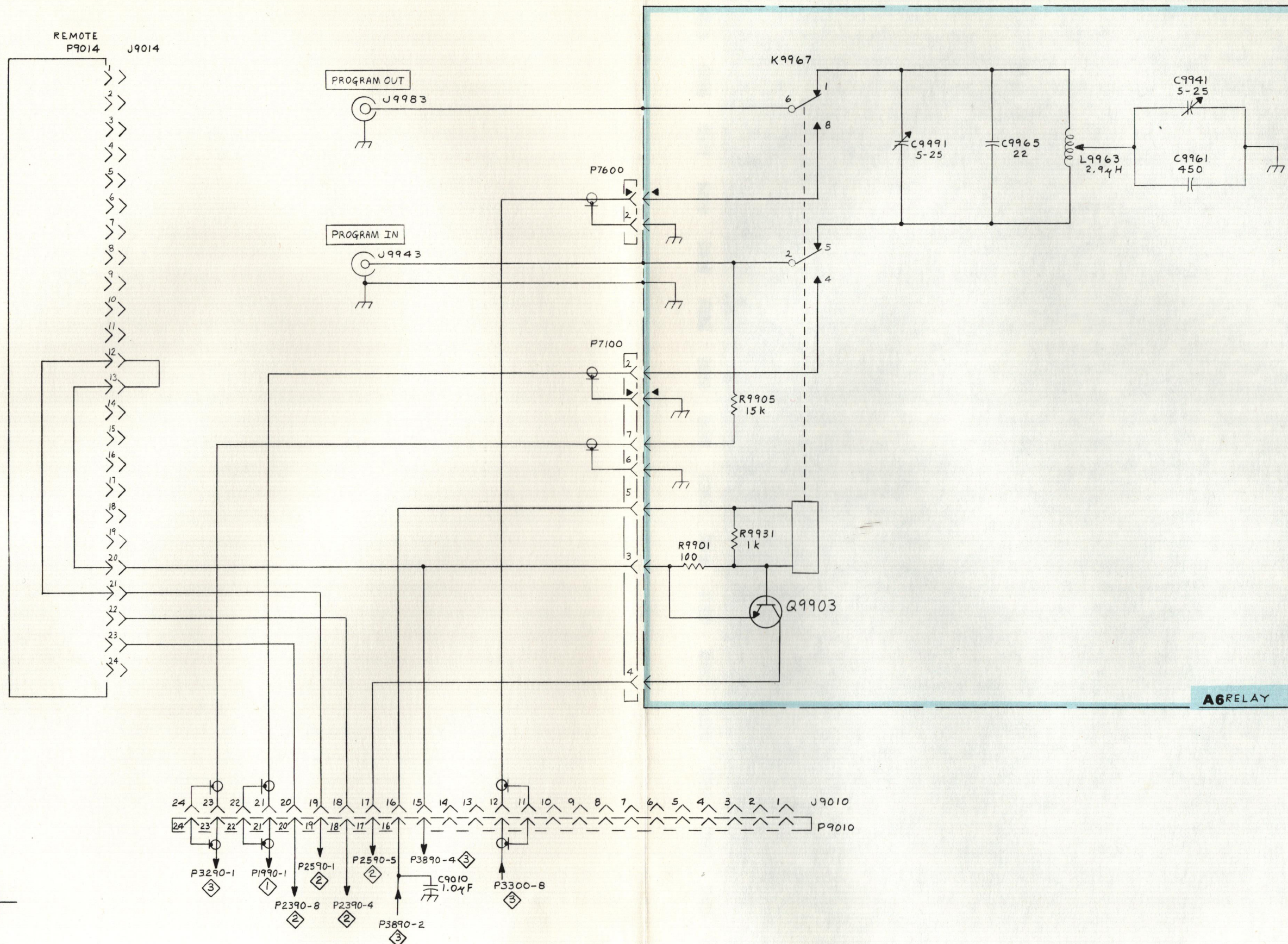
1441



RELAY BOARD COMPONENT LOCATIONS

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A6RELAY



# MECHANICAL REPLACEABLE PARTS LIST

## FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations which appear on pullout pages immediately following the diagrams of the instruction manual.

## INDENTATION SYSTEM

This mechanical parts list is indented to indicated item relationships. Following is an example of the indentation system used in the Description column.

*Assembly and/or Component*  
*Detail Part of Assembly and/or Component*  
*Attaching parts for Detail Part*  
*Parts of Detail Part*  
*Attaching parts for Parts of Detail Part*  
*Attaching parts for Assembly and/or Component*

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation.

Attaching parts must be purchased separately, unless otherwise specified.

## PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

## SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number



# CROSS INDEX

## MFR. CODE NUMBER TO MANUFACTURER

## AND

## ABBREVIATIONS

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00779	AMP, Inc.	P. O. Box 3608	Harrisburg, PA 17105
02660	Bunker-Ramo Corp., The, Amphenol Connector Div.	2801 S. 25th Ave.	Broadview, IL 60153
09353	C and K Components, Inc.	103 Morse Street	Watertown, MA 02172
09422	Plastic Stamping Corp.	2216 W. Armitage Ave.	Chicago, IL 60647
12327	Freeway Washer and Stamping Co.	P. O. Box 05206	Cleveland, OH 44105
22526	Berg Electronics, Inc.	Youk Expressway	New Cumberland, PA 17070
24931	Specialty Connector Co., Inc.	3560 Madison Ave.	Indianapolis, IN 46227
32436	Syscon International, Inc.	205 Sycamore St.	South Bend, IN 46622
45391	Pacific Metal Co.	3400 S. W. Bond Ave.	Portland, OR 97201
70903	Belden Corp.	415 S. Kilpatrick	Chicago, IL 60644
71785	TRW Electronic Components, Cinch Div.	1501 Morse Ave.	Elk Grove Village, IL 60007
73743	Fischer Special Mfg. Co.	446 Morgan St.	Cincinnati, OH 45206
75915	Littlefuse, Inc.	800 E. Northwest Hwy.	Des Plaines, IL 60016
78189	Illinois Tool Works, Inc.		
	Shakeproof Division	St. Charles Road	Elgin, IL 60126
78488	Stackpole Carbon Co.		St. Marys, PA 15857
78947	Ucinite Co., The, A United-Carr Div. of TRW, Inc.	459 Watertown St.	Newtonville, MA 02160
79136	Waldes, Kohinoor, Inc.	47-16 Austel Place	Long Island City, NY 11101
80009	Tektronix, Inc.	P. O. Box 500	Beaverton, OR 97005
80033	Prestole Everlock, Inc.	P. O. Box 278	Toledo, OH 43605
83385	Central Screw Co.	2530 Crescent Dr.	Broadview, IL 60153
94222	Southco, Inc.		Lester, PA 19113
95712	Bendix Corp., The Electrical Components Div., Microwave Devices Plant	Hurrican Road	Franklin, IN 46131
98291	Sealectro Corp.	225 Hoyt	Mamroneck, NY 10544

### ABBREVIATIONS

#	number size	FSTNR	fastener	SCR	screw
ASSEM	assembled	Hex.	hexagon	SE	single end
ASSY	assembly	IC	Integrated circuit	SECT	section
AWG	American wire gage	ID	inside diameter	SEMICOND	Semiconductor
BRS	brass	IN	inch	SH	shield
CHAS	chassis	INSUL	insulator	SKT	socket
CKT	circuit	LPHLDR	lampholder	SLVG	sleeving
CONN	connector	MECH	mechanical	SPR	spring
DEG	degree	OBD	Order by description	SST	Stainless steel
DWR	drawer	OD	outside diameter	STL	steel
ELEC	electrical	PNH	pan head	TERM	terminal
EPL	Electrical Parts List	PLSTC	plastic	TNSN	tension
EQPT	equipment	RCPT	receptical	W/	with
EXT	external	RTNR	retainer	XSTR	transistor
FLH STL	flat head, steel				



FIGURE 1 EXPLODED

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	390-0276-00		1		CABINET, TOP:	80009	390-0276-00
-	- - - - -		-		CABINET TOP INCLUDES:		
-2	355-0134-00		11		STUD, TURNLOCK F: FLAT HEAD STEEL	94222	82-14-140-16
-3	214-0389-00		11		FSTNR, RETAINER: SPLIT RING	94222	82-32-101-17
-4	351-0104-00		1		SLIDE SECT., DWR: (PAIR)	80009	351-0104-00
-5	212-0004-00		2		(ATTACHING PARTS FOR EACH) SCREW, MACHINE: 8-32 x 0.312 INCH, PNH STL	83385	OBD
-6	354-0025-00		2		RING, RETAINING:	79136	5555-18
-7	210-0894-00		1		WASHER, NONMETAL: 0.190 ID x 0.437 INCH OD	09422	OBD
-8	213-0216-00		2		THUMBSCREW: 10-32 x 0.750 INCH LONG, SST	80009	213-0216-00
-9	367-0160-00		2		HANDLE: CARRYING	80009	367-0160-00
-10	211-0014-00		2		(ATTACHING PARTS FOR EACH) SCREW, MACHINE: 4-40 x 0.50 INCH, PNH STL	83385	OBD
-11	407-1073-00		2		BRACKET, ANGLE:	80009	407-1073-00
-12	212-0004-00		2		(ATTACHING PARTS FOR EACH) SCREW, MACHINE: 8-32 x 0.312 INCH, PNH STL	83385	OBD
-13	260-0834-00		1		SWITCH, TOGGLE: POWER, W/HARDWARE (S9201)	09353	7201-SN
-14	131-0779-00		2		JACK, TIP: (J9220 & J9225)	98291	016-8010
-15	333-1601-00		1		PANEL, FRONT:	80009	333-1601-00
-16	210-0457-00		2		(ATTACHING PARTS) NUT, PLAIN, EXT W: 6-32 x 0.312 INCH, STL	83385	OBD
-17	200-0609-00		1		BASE, LAMPHOLDER:	80009	200-0609-00
-18	378-0541-00		1		LENS, LIGHT: FROSTED	80009	378-0541-00
-19	352-0084-00		1		HOLDER, NEON:	80009	352-0084-00
-20	200-0935-00		5		COVER, LPHLDR:	80009	200-0935-00
-21	378-0602-00		2		LENS, LIGHT: GREEN	80009	378-0602-00
-22	378-0602-01		1		LENS, LIGHT: AMBER	80009	378-0602-01
-23	378-0602-02		2		LENS, LIGHT: RED	80009	378-0602-02
-24	352-0157-01		5		LAMPHOLDER: BLACK	80009	352-0157-01
-25	- - - - -		1		CKT BOARD ASSY:--TIMING (SEE A1 EPL)		
-26	131-0608-00		-		CKT BOARD ASSY INCLUDES:		
	131-0589-00		58		CONTACT, ELEC: 0.365 INCH LONG	22526	47357
-27	136-0252-04		29		CONTACT, ELEC: 0.50 INCH LONG	22526	47350
-28	136-0269-00		114		SOCKET, CONN PIN: SINGLE	22526	75060-001
-29	214-0579-00		6		SOCKET, IC: 14 PIN, INLINE	71785	133-51-02-073
-30	352-0198-00		1		CONTACT, ELEC: TEST POINT	80009	214-0579-00
-31	131-0621-00		1		HOLDER, TERM CON: 2 WIRE (BLACK)	80009	352-0198-00
-32	352-0177-00		2		CONNECTOR, TERM: 0.58 INCH LONG (22-26 AWG)	22526	46231
-33	131-0707-00		1		HOLDER, TERM CON: DOUBLE ROW, 6 WIRE (BLACK)	80009	352-0177-00
-34	- - - - -		6		CONNECTOR, TERM: 0.50 INCH LONG (22-26 AWG)	22526	47439
-35	131-0589-00		1		CKT BOARD ASSY:--MODULATOR (SEE A2 EPL)		
	131-0608-00		-		CKT BOARD ASSY INCLUDES:		
-36	136-0252-04		41		CONTACT, ELEC: 0.50 INCH LONG	22526	47350
-37	136-0241-00		14		CONTACT, ELEC: 0.365 INCH LONG	22526	47357
-38	136-0269-00		39		SOCKET, CONN PIN: SINGLE	22526	75060-001
-39	214-0506-00		1		SOCKET, XSTR: 10 PIN, ROUND	71785	133-99-12-064
-40	352-0134-00		13		SOCKET, IC: 14 PIN, INLINE	71785	133-51-02-073
-41	352-0169-00		1		CONTACT, ELEC: 0.375 INCH LONG	80009	214-0506-00
-42	131-0707-00		1		HOLDER, COIL: TOROIDAL	80009	352-0134-00
-43	- - - - -		3		HOLDER, TERM CON: 2 WIRE (BLACK)	80009	352-0169-00
-44	131-0566-00		6		CONNECTOR, TERM: 0.50 INCH LONG (22-26 AWG)	22526	47439
-45	131-0589-00		1		CKT BOARD ASSY:--AMPLIFIER (SEE A3 EPL)		
-46	131-0998-00		-		CKT BOARD ASSY INCLUDES:		
-47	136-0252-04		1		LINK, TERM CONN: 2.38 IN. AWG 22 W/PLSTC SLVG	80009	131-0566-00
-48	136-0235-00		28		CONTACT, ELEC: 0.50 INCH LONG	22526	47350
-49	136-0260-01		1		BUSS BAR: 9 TERM 8.132 IN. LONG, CUT TO FIT	80009	131-0998-00
-50	210-0652-00		63		SOCKET, CONN PIN: SINGLE	22526	75060-001
-51	214-0579-00		1		SOCKET, XSTR: 6 PIN, ROUND	71785	133-96-12-062
-52	276-0507-00		1		SOCKET, IC: 16 PIN, INLINE	71785	133-51-02-075
			1		EYELET, METALLIC: 0.115 OD x 0.205 INCH LONG	80009	210-0652-00
			2		CONTACT, ELEC: TEST POINT	80009	214-0579-00
			1		SHIELDING BEAD: 0.6UH	78488	57-0180-7D



FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-53	- - - - -	-	1		CKT BOARD ASSY:--GEN LOCK (SEE A4 EPL)		
-54	131-0589-00	-	-		CKT BOARD ASSY INCLUDES:		
-55	352-0096-00	-	18		CONTACT,ELEC:0.50 INCH LONG	22526	47350
-56	136-0234-00	-	1		CLIP,SPR TNSN:CRYSTAL	80009	352-0096-00
-57	136-0252-04	-	2		SOCKET,CONN PIN:CRYSTAL	00779	380598-1
-58	136-0237-00	-	85		SOCKET,CONN PIN:SINGLE	22526	75060-001
-59	136-0241-00	-	1		SOCKET,XSTR:8 PIN, ROUND	71785	133-98-12-062
-60	214-0579-00	-	2		SOCKET,IC:10 PIN,ROUND	71785	133-99-12-064
-61	337-1417-00	-	2		CONTACT,ELEC:TEST POINT	80009	214-0579-00
-62	- - - - -	-	1		SHLD,ELECTRICAL:COVER,0.550 INCH SQUARE	32436	OBD
-63	211-0116-00	-	1		CKT BOARD ASSY:--POWER SUPPLY (SEE A5 EPL)		
	- - - - -	-	-		(ATTACHING PARTS)		
	- - - - -	-	2		SCR,ASSEM WSHR:4-40 x 0.312 INCH,PNH BRS	83385	OBD
-64	131-0589-00	-	-		CKT BOARD ASSY INCLUDES:		
-65	136-0252-04	-	57		CONTACT,ELEC:0.50 INCH LONG	22526	47350
-66	214-0579-00	-	36		SOCKET,CONN PIN:SINGLE	22526	75060-001
-67	- - - - -	-	4		CONTACT,ELEC:TEST POINT	80009	214-0579-00
-68	211-0513-00	-	1		TRANSFORMER:(SEE T9001 EPL)		
-69	210-0802-00	-	-		(ATTACHING PARTS)		
-70	210-0006-00	-	4		SCREW MACHINE:6-32 x 0.625 INCH,PNH STL	83385	OBD
71	129-0391-00	-	4		WASHER,FLAT:0.150 ID x 0.312 INCH OD,STL	12327	OBD
	- - - - -	-	4		WASHER,LOCK:INTL,0.146 ID x 0.283" OD,STL	78189	1206-00-00-0541C
-72	- - - - -	-	4		POST,ELEC-MECH:0.375 HEX x 0.375" LONG	80009	129-0391-00
-73	210-0586-00	-	-		TRANSISTOR:(SEE Q9035,Q9055 & Q9085 EPL)		
-74	342-0163-00	-	3		(ATTACHING PARTS FOR EACH)		
-75	131-0149-00	-	1		NUT,PLAIN,EXT W:4-40 x 0.25 INCH,STL	83385	OBD
-76	211-0012-00	-	1		INSULATOR:MICA,0.675 x 0.625 INCH	80009	342-0163-00
-77	210-0201-00	-	-		CONN,RECP,ELEC:MALE 24 PIN (P9010)		
-78	210-0586-00	-	-		(ATTACHING PARTS)		
-79	352-0362-00	-	2		SCREW,MACHINE:4-40 x 0.375 INCH,PNH STL	83385	OBD
-80	- - - - -	-	2		TERMINAL,LUG:0.094 INCH DIAMETER,SE	78189	2104-04-00-2502N
-81	210-0586-00	-	2		NUT,PLAIN,EXT W:4-40 x 0.25 INCH,STL	83385	OBD
-82	211-0012-00	-	-		FUSEHOLDER:WITH MOUNTING HARDWARE		
-83	210-0202-00	-	1		LINE FILTER:(SEE FL 9201 EPL)	75915	345001
-84	210-0457-00	-	-		(ATTACHING PARTS)		
-85	214-1696-00	-	2		NUT,PLAIN,EXT W:4-40 x 0.25 INCH,STL	83385	OBD
-86	214-1696-00	-	2		SCREW,MACHINE:4-40 x 0.375 INCH,PNH STL	83385	OBD
-87	210-0202-00	-	-		TERMINAL,LUG:SE #6		
-88	344-0133-00	-	4		(ATTACHING PARTS FOR EACH)		
-89	210-0586-00	-	1		NUT,PLAIN,EXT W:6-32 x 0.312 INCH,STL	83385	OBD
-90	385-0135-00	-	-		PIN,GUIDE:CIRCUIT BOARD		
-91	211-0559-00	-	5		PIN,GUIDE:CIRCUIT BOARD	80009	214-1696-00
-92	441-1055-00	-	3		(ATTACHING PARTS FOR EACH)		
-93	344-0118-00	-	1		TERMINAL,LUG:SE #6	78189	2104-06-00-2520N
-94	210-0610-00	-	-		CLIP,SPG TENS:CIRCUIT BOARD MOUNTING		
-95	214-0388-00	-	16		(ATTACHING PARTS FOR EACH)		
-96	210-0657-01	-	1		NUT,PLAIN,EXT W:4-40 x 0.25 INCH,STL	83385	OBD
-97	129-0105-00	-	3		INSUL,STANDOFF:0.312 OD x 0.938 INCH LONG	80009	385-0135-00
	- - - - -	-	1		SCREW,MACHINE:6-32 x 0.375"100 DEG,FLH STL	83385	OBD
	- - - - -	-	-		CHAS,ELEC EQUIP:MAIN		
	- - - - -	-	1		CHASSIS INCLUDES:	80009	441-1055-00
	- - - - -	-	6		CLIP,SPR,TNSN:CAPACITOR MOUNTING	80033	E50008-041
	- - - - -	-	-		(ATTACHING PARTS FOR EACH)		
	- - - - -	-	1		RIVET,ALUMINUM:0.125 x 0.188 INCH LONG	45391	6053T61
	- - - - -	-	-		FASTENER RCPT:LEAF SPRING		
	- - - - -	-	11		(ATTACHING PARTS FOR EACH)		
	- - - - -	-	2		EYELET:0.089 OD,BARREL,0.218 INCH LONG	80009	210-0657-01
	- - - - -	-	2		POST,ELEC-MECH:0.218 OD x 0.219 INCH LONG	80009	129-0105-00



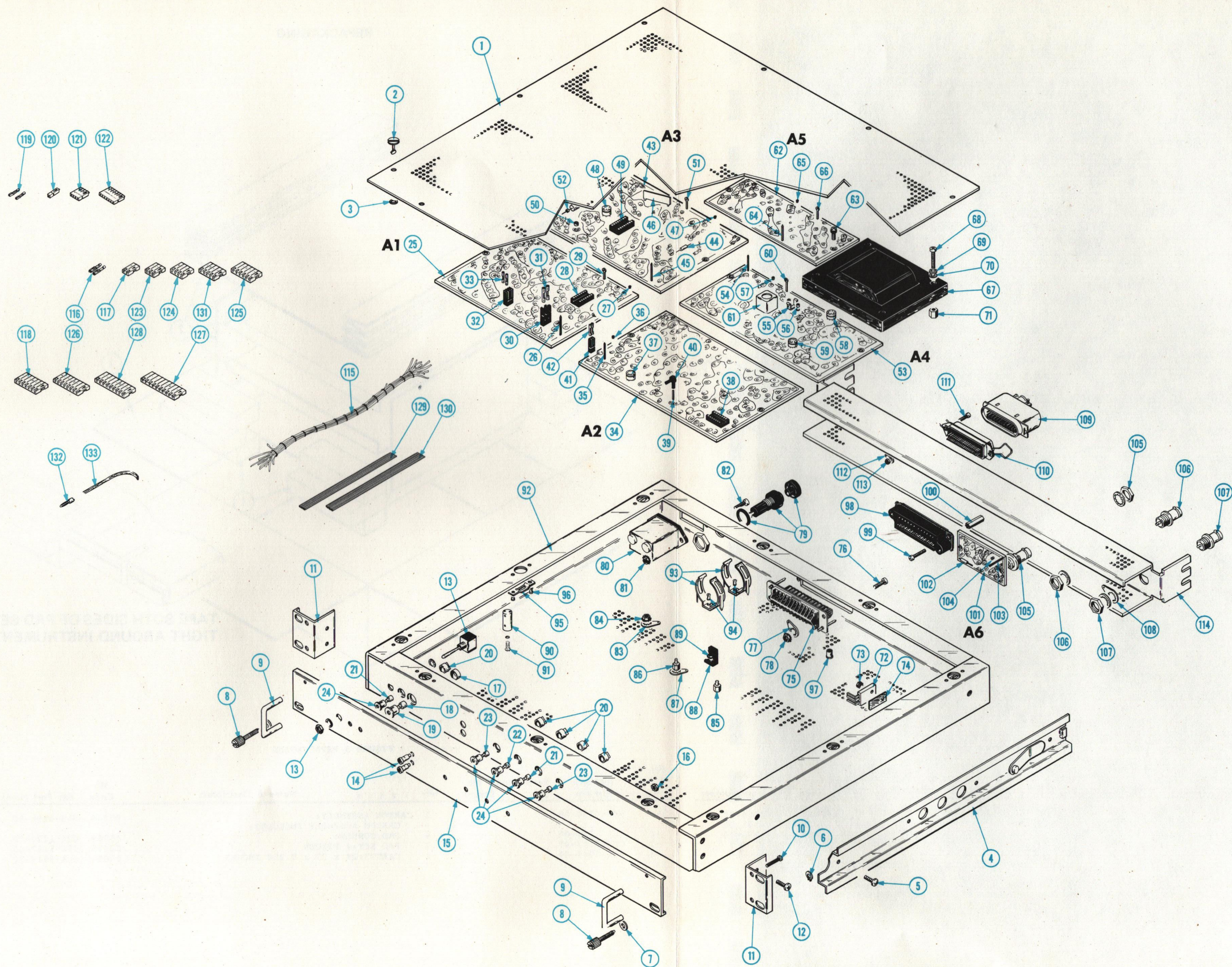
FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-98	131-0148-00		1		CONN,RCPT,ELEC:FEMALE 24 PIN (J9010) (ATTACHING PARTS)	02660	26-190-24-1004
-99	211-0014-00		2		SCREW,MACHINE:4-40 x 0.50 INCH,PNH STL	83385	OBD
-100	129-0371-00		2		POST,ELEC-MECH:0.25 HEX., x 0.83 INCH LONG - - - * - - -	80009	129-0371-00
-101	- - - - -		1		CKT BOARD ASSY:--RELAY (SEE A6 EPL)		
-	- - - - -		-		CKT BOARD ASSY INCLUDES:		
-102	131-0566-00		1		LINK,TERM.CONN:2.38" AWG 22 W/PLSTC SLV	80009	131-0566-00
-103	131-0589-00		9		CONTACT,ELEC:0.50 INCH LONG	22526	47350
-104	136-0252-04		11		SOCKET,CONN PIN:SINGLE	22526	75060-001
-105	131-1097-00		2		CONN,RCPT,ELEC:BNC,WITH HARDWARE	24931	28JR220-1
-106	131-0126-00		2		CONN,RCPT,ELEC:BNC,WITH HARDWARE	95712	9663-1NT-34
-107	131-0126-00		2		CONN,RCPT,ELEC:BNC,WITH HARDWARE (ATTACHING PARTS FOR EACH)	95712	9663-1NT-34
-108	210-0241-00		1		TERMINAL,LUG:0.515 ID x 0.625 INCH OD,SE - - - * - - -	80009	210-0241-00
-109	131-0325-00		1		CONN,PLUG,ELEC:MALE 24 PIN (P9014)	71785	57-30240398
-110	131-0324-00		1		CONN,RCPT,ELEC:FEMALE 24 PIN (J9014) (ATTACHING PARTS)	71785	57-40240398
-111	211-0062-00		2		SCREW,MACHINE:2-56 x 0.312 INCH,PNH STL	83385	OBD
-112	210-0259-00		2		TERMINAL,LUG:0.099 INCH DIAMETER,SE	80009	210-0259-00
-113	210-0405-00		2		NUT,PLAIN,HEX:2-56 x 0.188 INCH,BRS - - - * - - -	73743	2X12157-402
-114	441-1059-01		1		CHAS,ELEC EQUIP:INTERFACE	80009	441-1059-01
-115	179-1964-00		1		WIRING HARNESS:RELAY - - - - -	80009	179-1964-00
-	- - - - -		-		WIRING HARNESS INCLUDES:		
-116	131-0792-00		3		CONNECTOR,TERM:0.58 INCH LONG (18-20 AWG)	22526	46221
	131-0621-00		3		CONNECTOR,TERM:0.58 INCH LONG (22-26 AWG)	22526	46231
	131-0622-00		3		CONNECTOR,TERM:0.58 INCH LONG (28-32 AWG)	22526	46241
-117	352-0198-00		1		HOLDER,TERM CON:2 WIRE (BLACK)	80009	352-0198-00
-118	352-0203-00		1		HOLDER,TERM CON:7 WIRE (BLACK)	80009	352-0203-00
	179-1965-00		1		WIRING HARNESS:MAIN - - - - -	80009	179-1965-00
-	- - - - -		-		WIRING HARNESS INCLUDES:		
-119	131-0707-00		15		CONNECTOR,TERM:0.50 INCH LONG (22-26 AWG)	22526	47439
	131-0792-00		17		CONNECTOR,TERM:0.58 INCH LONG (18-20 AWG)	22526	46221
	131-0621-00		54		CONNECTOR,TERM:0.58 INCH LONG (22-26 AWG)	22526	46231
	131-0622-00		17		CONNECTOR,TERM:0.58 INCH LONG (28-32 AWG)	22526	46421
-120	352-0171-00		3		HOLDER,TERM CON:1 WIRE (BLACK)	80009	352-0171-00
-121	352-0162-00		1		HOLDER,TERM CON:4 WIRE (BLACK)	80009	352-0162-00
-122	352-0165-00		2		HOLDER,TERM CON:7 WIRE (BLACK)	80009	352-0165-00
	352-0198-00		3		HOLDER,TERM CON:2 WIRE (BLACK)	80009	352-0198-00
-123	352-0199-00		3		HOLDER,TERM CON:3 WIRE (BLACK)	80009	352-0199-00
-124	352-0200-00		4		HOLDER,TERM CON:4 WIRE (BLACK)	80009	352-0200-00
-125	352-0202-00		1		HOLDER,TERM CON:6 WIRE (BLACK)	80009	352-0202-00
	352-0203-00		2		HOLDER,TERM CON:7 WIRE (BLACK)	80009	352-0203-00
-126	352-0204-00		1		HOLDER,TERM CON:8 WIRE (BLACK)	80009	352-0204-00
-127	352-0206-00		6		HOLDER,TERM CON:10 WIRE (BLACK)	80009	352-0206-00
	179-1966-00		1		WIRING HARNESS:POWER - - - - -	80009	179-1966-00
-	- - - - -		-		WIRING HARNESS INCLUDES:		
	131-0621-00		23		CONNECTOR,TERM:0.58 INCH LONG (22-26 AWG)	22526	46231
	352-0203-00		2		HOLDER,TERM CON:7 WIRE (BLACK)	80009	352-0203-00
-128	352-0205-00		1		HOLDER,TERM CON:9 WIRE (BLACK)	80009	352-0205-00
-129	175-0828-00		FT		WIRE,ELECTRICAL:5 WIRE RIBBON,0.334 FOOT	80009	175-0828-00
-130	175-0829-00		FT		WIRE,ELECTRICAL:9 WIRE RIBBON,0.334 FOOT	80009	175-0829-00
-131	352-0201-00		1		HOLDER,TERM CON:5 WIRE (BLACK)	80009	352-0201-00
-132	134-0015-00		1		PLUG,TIP:BANANA, MALE	78947	152004UF4
-133	176-0047-00		FT		BRAID,WIRE:0.25 FOOT LONG	70903	8660











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ACCESSORIES

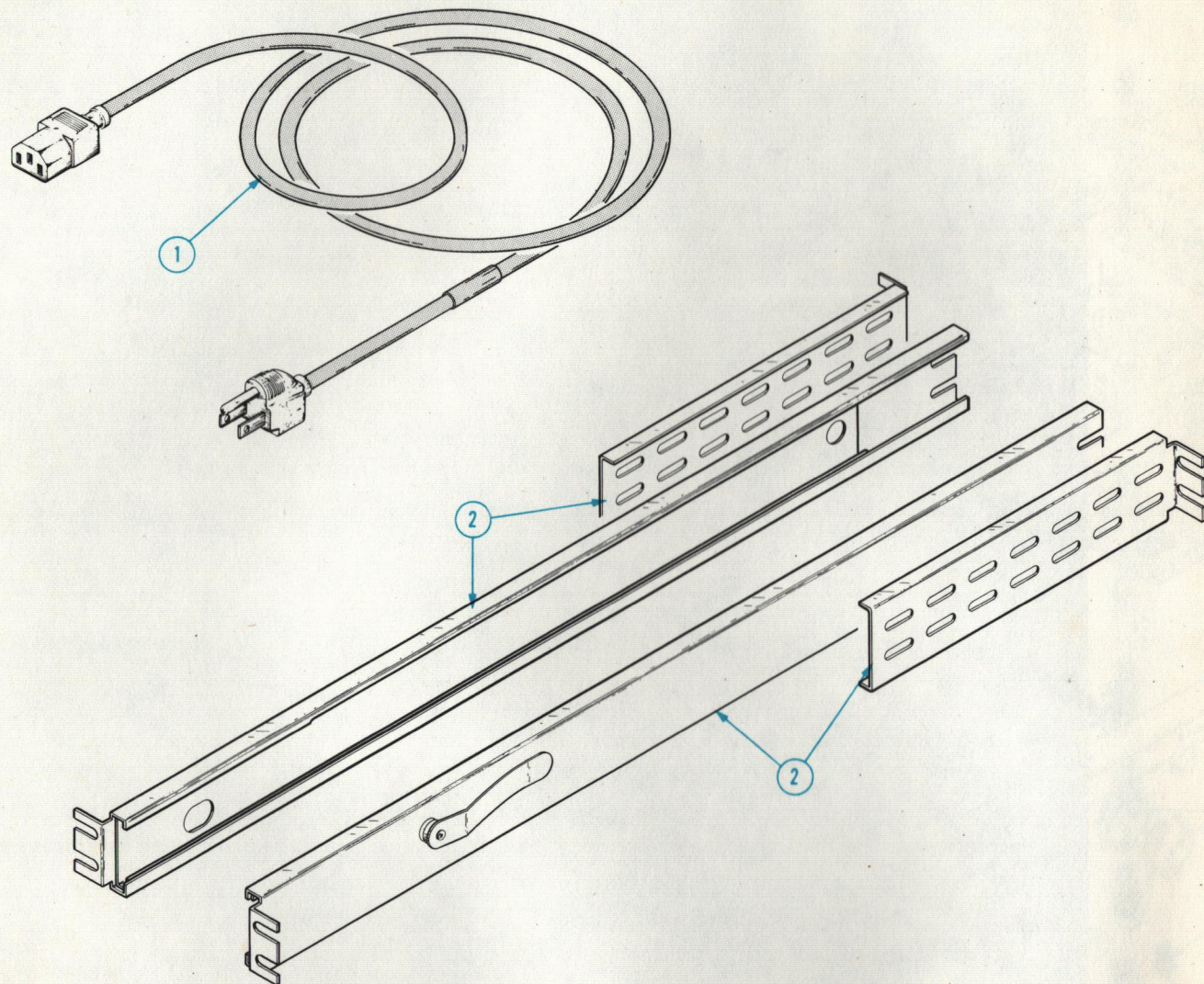


FIGURE 2 ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
2-1	161-0066-00			1						CABLE ASSEMBLY, PWR: 8 FOOT LONG	80009	161-0066-00
-2	351-0331-00			1						SLIDE GUIDE: (PAIR)	80009	351-0331-00
	070-1499-00			1						MAN., TECHNICAL: (NOT SHOWN)	80009	070-1499-00

REPACKAGING

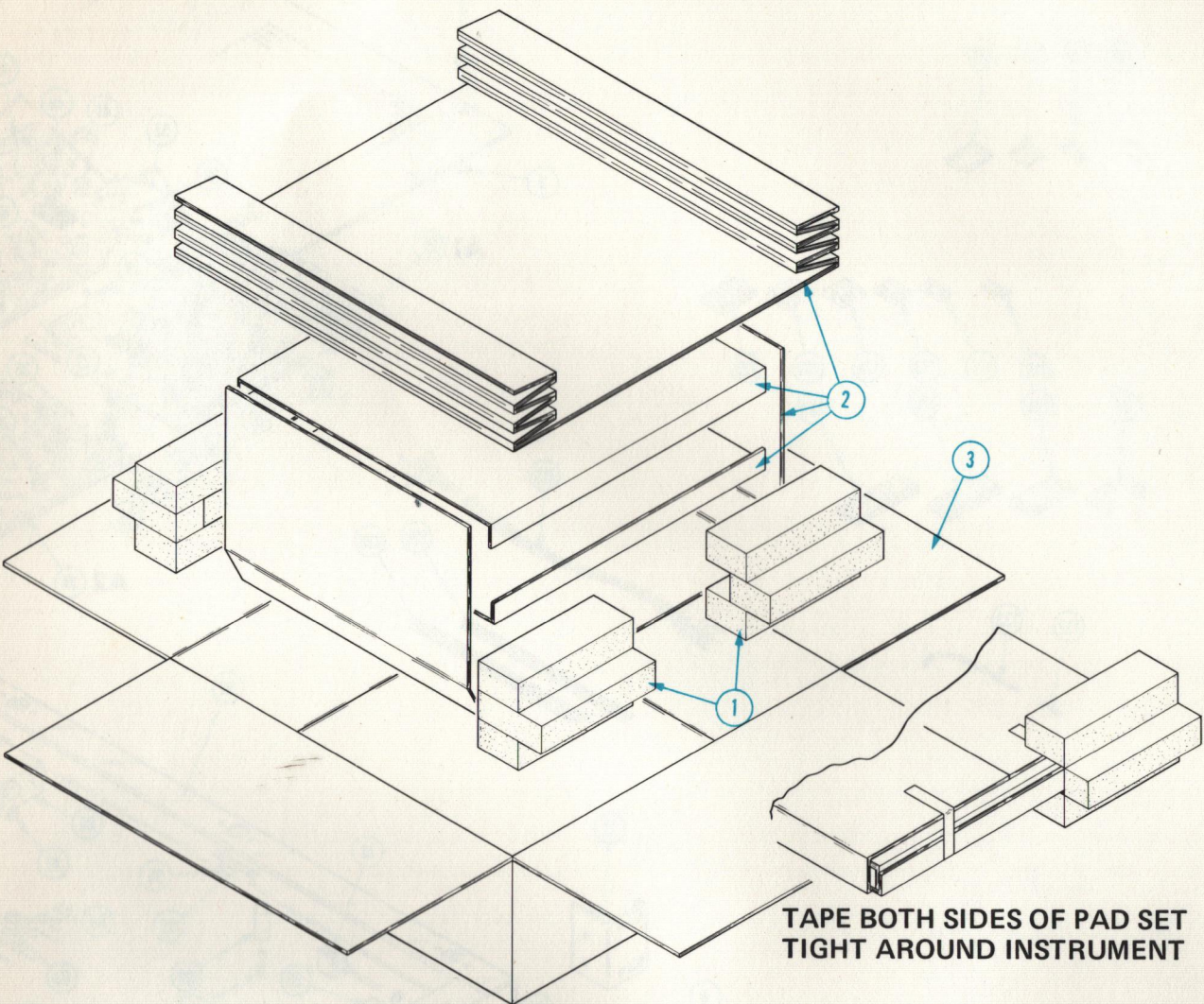


FIGURE 3 REPACKAGING

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
3-	065-0190-00			1						CARTON ASSEMBLY:	80009	065-0190-00
-1	004-1220-00			4						CARTON ASSEMBLY INCLUDES:	80009	004-1220-00
-2	004-1157-00			1						PAD, CORNER:	80009	004-1157-00
-3	004-0849-00			1						PAD SET: 4 PIECES	80009	004-1157-00
				1						CARTON: 24 x 23 x 8.250 INCHES	80009	004-0849-00



## MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Sections of the manual are often printed at different times, so some of the information on the change pages may already be in your manual. Since the change information sheets are carried in the manual until ALL changes are permanently entered, some duplication may occur. If no such change pages appear in this section, your manual is correct as printed.







1441 EFF SN B010100-up

ELECTRICAL PARTS LIST AND SCHEMATIC CORRECTION

CHANGE TO:

C2998	283-0599-00	98 pF, Mica, 500 V, 5%
C4420	283-0004-00	0.02 $\mu$ F, Cer, 150 V, +80%-20%



